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# DELPHACIDAE FROM AUSTRALIA AND NEW ZEALAND (HOMOPTERA : FULGOROIDEA)

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R. G. FENNAH

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BY

R. G. FENNAH ruf.

Commonwealth Institute of Entomology, London

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# DELPHACIDAE FROM AUSTRALIA AND NEW ZEALAND

# HOMOPTERA : FULGOROIDEA

*By* R. G. FENNAH

## SYNOPSIS

Descriptions are given of ten new species of Delphacidae from New Zealand, of six from Australia and of five from New Guinea. The generic assignments of all known species from New Zealand, and of ten species from Australia, are revised, and fourteen new genera are erected.

## INTRODUCTION

THIS report is based on a comprehensive collection of Delphacidae from New Zealand and a less representative collection from Australia and New Guinea received for study from Dr. T. E. Woodward, of the University of Queensland. Additional material from Australia was obtained from the collections in the British Museum (Nat. Hist) made by C. Darwin, R. E. Turner, R. W. Mungomery, J. G. Myers and others.

The writer's warmest thanks are tendered to Dr. Woodward, and to Mr. J. P. Doncaster, Keeper of the Department of Entomology in the British Museum (Nat. Hist.) for the privilege of examining these interesting collections. Thanks are also due to Dr. J. W. Beardsley of the Experiment Station of the Hawaiian Sugar Planters' Association for the loan of specimens from the type series of *Delphax dilpa* Kirkaldy and *Haplodelphax iuncicola* Kirkaldy.

In the General Catalogue of the Hemiptera, fasc. IV, part 3, four species of Delphacidae are listed from New Zealand, and a further two from the Kermadec Islands. The present collections have revealed the presence of a further twelve species in New Zealand and the outlying Three Kings group. Ten of them are new to science and are apparently endemic.

The Australian collections, which came almost entirely from the eastern side of the continent, were found to contain few series ; a substantial number of the known species were not represented, and six new species were found. Such a lack of repetitiveness in the material indicates that the Delphacid fauna is still very incompletely surveyed, both as regards composition and distribution. It is evident, from a consideration of the genera present, that a strong Papuan element is present in eastern Australia, and that there is a small group, represented by such genera as *Haplodelphax* and *Pseudembolophora*, that is comparatively isolated, and may well represent an old native element.

A key is given for the separation of genera discussed below. Measurements of the head and thorax are taken as shown in Fennah, 1963 : 75 (fig. 20) ; where the anterior margin of the frons is appreciably convex, the length is measured along the middle line ; where it is transverse, it is measured close to, but to the side of, the narrow median projection caused by the thickness of the carinae, at their point of transition into the frons. The position of the post-trochanters is taken as the most anterior position that they can attain. The length of the basal post-tarsal segment is measured dorsally from its base to the point of insertion of the second segment.

The bibliographic references are cited in accordance with the usage in " A Bibliography of the Homoptera (Auchenorhyncha) " (Metcalf, Z. P., 1942, N.C. State College of Agriculture and Engineering, University of North Carolina, Raleigh, N.C.).

### KEY TO GENERA OF DELPHACIDAE OF AUSTRALIA AND NEW ZEALAND

| | | | | |
|---|---|---|---|---|
| 1 | | Post-tibial spur awl-shaped . . . . | ***UGYOPS*** Guérin-Méneville (p. 6) | 2 |
| – | | Post-tibial spur wedge-shaped, or thin and tectiform . . . . . . | | 3 |
| 2 | (1) | Antennae cylindrical . . . . . . . . | subgenus ***UGYOPS*** (p. 6) | |
| – | | Antennae with at least basal segment slightly compressed | subgenus ***PARACONA*** nov. (p. 11) | |
| 3 | (1) | Post-tibial spur wedge-shaped, with only a single tooth at apex . . . | | 4 |
| – | | Post-tibial spur tectiform, with teeth on margin . . . . . . . | | 6 |
| 4 | (3) | Vertex extremely elongate, about as long as remainder of body | ***PSEUDEMBOLOPHORA*** Muir (p. 12) | |
| – | | Vertex at most less than three times as long as broad . . . . . . | | 5 |
| 5 | (4) | Vertex longer than broad, basal segment of antennae cylindrical . . . | ***TROPIDOCEPHALA*** Stål (p. 12) | |
| – | | Vertex broader than long, basal segment of antennae compressed | ***HAERINELLA*** gen. n. (p. 13) | |
| 6 | (3) | Frons with median carina forked near middle . . . . . . . . | | 7 |
| – | | Frons with median carina simple, or forked at base, or with two carinae separate to apex . . . . . . . . . . . . . . | | 14 |
| 7 | (6) | Antennae with basal segment triangular and compressed . . . . . | | 8 |
| – | | Antennae with basal segment cylindrical . . . . . . . . . . | | 10 |
| 8 | (7) | Vertex much broader than long . . . . . . . . . . . | | 9 |
| – | | Vertex about as broad as long . . . . | ***PHACALASTOR*** Kirkaldy (p. 17) | |
| 9 | (8) | Post-clypeus short, about as long as basal antennal segment ; post-tibial spur not long, with about 18 teeth ; pygofer devoid of processes ventrally on hind margin . . . . . . . . | ***TEMENITES*** gen. n. (p. 15) | |
| – | | Post-clypeus not short, longer than basal segment of antenna ; post-tibial spur rather long, with more than 30 teeth ; pygofer with a pair of processes ventrally on hind margin . . . . | ***PERKINSIELLA*** Kirkaldy (p. 16) | |
| 10 | (7) | Profemora and protibiae foliately expanded, antennae relatively long | ***PELIADES*** Bierman (p. 17) | |
| — | | Profemora and protibiae not foliately expanded . . . . . . . | | 11 |
| 11 | (10) | Lateral carinae of pronotum straight, attaining hind margin . . . . . | | 12 |
| — | | Lateral carinae of pronotum curved laterad, not attaining hind margin . . | | 13 |
| 12 | (11) | Form slender ; frons more than 2·5 times as long as broad ; pygofer with a medioventral process . . . . | ***THRASYMEMNON*** gen. n. (p. 43) | |
| — | | Form robust ; frons not more than twice as long as broad ; pygofer without a medioventral process . . . . . . | ***PEREGRINUS*** Kirkaldy (p. 18) | |
| 13 | (11) | Vertex broader at base than long in middle line ; basal antennal segment fully twice as long as broad . . . . . . | ***CEMUS*** Fennah (p. 19) | |

— Vertex longer in middle line than broad at base ; basal antennal segment not twice as long as broad ***THYMALOPS*** gen. n. (p. 20)

14 (6) Frons with two submedian carinae 15

— Frons with a single median carina 16

15 (14) Vertex obtusely rounding into frons, which is about twice as long as broad ; ocelli distinct ***APLANODES*** gen. n. (p. 21)

— Vertex acutely rounding into frons, which is not nearly twice as long as broad ; ocelli absent ***NOTOHYUS*** gen. n. (p. 22)

16 (14) Basal segment of post-tarsi with one or more spines laterally ***NILAPARVATA*** Distant (p. 24)

— Basal segment of post-tarsi without teeth laterally 17

17 (16) Post-tibial spur with less than 13 teeth 18

— Post-tibial spur with 13 teeth or more 23

18 (17) Head with eyes wider than pronotum ***SMICROTATODELPHAX*** Kirkaldy

— Head with eyes not wider than pronotum 19

19 (18) Vertex distinctly broader than long, insensibly passing into frons ***NOTOGRYPS*** gen. n. (p. 26)

— Vertex at least as long as broad, more or less distinctly separable from frons 20

20 (19) Basal segment of antennae fully twice as long as broad ***PROTEROSYDNE*** Kirkaldy

— Basal segment of antennae not nearly twice as long as broad 21

21 (20) Vertex in profile meeting frons obtusely ; frons broadly rounded at basal margin ***EORISSA*** gen. n. (p. 28)

— Vertex in profile meeting frons subrectangularly or acutely ; frons with basal margin only weakly convex 22

22 (21) Vertex in profile meeting frons acutely ; sublateral carinae of vertex each straight from base to apex ***HAPLODELPHAX*** Kirkaldy (p. 31)

— Vertex in profile rounding subrectangularly into frons ; sublateral carinae of vertex each strongly concave or angulately bent between base and apex ***ANCHODELPHAX*** gen. n. (p. 34)

23 (17) Head with eyes broader than pronotum ***SMICROTATODELPHAX*** Kirkaldy

— Head with eyes not broader than pronotum 24

24 (23) Vertex longer than broad at base 25

— Vertex not longer than broad at base 36

25 (24) Second antennal segment three times as long as first ***STENOCRANUS*** Fieber

— Second antennal segment distinctly less than three times as long as first 26

26 (25) Basal segment of antennae fully three times as long as broad, second segment subequal ***TAROPHAGUS*** Zimmerman (p. 37)

— Basal segment of antennae relatively shorter, second segment distinctly longer than first 27

27 (26) Rostrum long, attaining post-trochanters or very nearly so 28

— Rostrum not attaining post-trochanters 29

28 (27) Mesonotum polished, with intercarinal areas shallowly concave ***ACRODELPHAX*** gen. n. (p. 38)

— Mesonotum finely granulate, shallowly convex with carinae fine, not prominent ***IZELLA*** gen. n. (p. 41)

29 (27) Frons about three times as long as broad ***SARDIA*** Melichar p. 44)

— Frons relatively shorter 30

30 (29) Lateral carinae of pronotum straight or convex, reaching hind margin or very nearly so 31

— Lateral carinae of pronotum straight or curved laterad, evidently not reaching hind margin 33

31 (30) Submedian carinae of vertex meeting before apex of vertex . . . . 32

— Submedian carinae of vertex meeting at apex, or on frons ***SOGATODES*** Fennah (p. 45)

32 (31) Basal segment of antenna little longer than broad ; second segment less than three times as long as broad . . . ***CORONACELLA*** Metcalf (p. 47)

— Basal segment of antenna fully twice as long as broad ; second segment at least three times as long as broad . . . . . . . ***SOGATA*** Distant

33 (30) Rostrum reaching to mesotrochanters, short in relation to length of frons and clypeus ; slender, delicately formed species usually with a pale median stripe on head and thorax . . . . . . ***SOGATELLA*** Fennah (p. 47)

— Rostrum surpassing mesotrochanters, not short in relation to length of frons and clypeus, robust species without a pale median stripe dorsally (except *Tarophagus*) 34

34 (33) Vertex not narrower than an eye, basal segment of post-tarsus short, less than three quarters as long as frons . . . . . . . . . . 35

— Vertex narrower than an eye, basal segment of post-tarsus long, three quarters as long as frons . . . . . . . ***SYNDELPHAX*** Fennah (p. 48)

35 (34) Frons twice as long as postclypeus . . . . ***CORBULO*** gen. n. (p. 48)

— Frons 2·5 times as long as postclypeus . . . ***SULIX*** gen. n. (p. 49)

36 (24) Basal segment of antennae fully three times as long as broad ***TAROPHAGUS*** Zimmerman (p. 37)

— Basal segment of antennae relatively shorter . . . . . . . 37

37 (36) Antennae slender, second segment reaching well beyond base of clypeus ***EUMETOPINA*** Breddin (p. 54)

— Antennae not slender, scarcely or not surpassing frontoclypeal suture . . 38

38 (37) Sublateral carinae of vertex meeting before apex of vertex, lateral pronotal carinae very strongly divergent and extending almost straight towards tegulae. Post-tibial spur with about forty teeth . ***ANECTOPIA*** Kirkaldy

— Sublateral carinae of vertex meeting at apex of vertex or on base of frons, lateral pronotal carinae not very strongly divergent, or, if so, then not straight. Post-tibial spur with fewer than forty teeth . . . . . 39

39 (38) Lateral carinae of pronotal disc straight, directed latero-caudad mesad of tegulae. A white median dorsal stripe on head and thorax. Abdomen of female in ventral view rather narrowly triangular in outline ***TERTHRON*** gen. n. (p. 55)

— Lateral carinae of pronotal disc curved laterad, or if straight, extending directly towards tegulae. No white median stripe present dorsally. Abdomen of female in ventral view not narrowly triangular in outline, but more bluntly rounded distally . . . . . . . . . ***TOYA*** Distant (p. 56)

## ***UGYOPS*** Guérin-Méneville

Guérin-Méneville, 1834a, 477.
Haplotype, *Ugyops percheronii* Guérin-Méneville, *op. cit.*

The Australian representatives of the genus comprise three continental species, *U. longiceps* Muir, *U. brevifrons* (Jac.), and *U. longifrons* Jac., and an insular species, *U. musgravei* Muir (from Lord Howe Id.). In New Zealand only one nominal species has been recognized (*Micromasoria caelata* (White)) and a further species, *Micromasoria raouli* Muir, is known from Raoul Id.

The material in the present collection from New Zealand proper includes three species. Members of two of them have terete antennae, like all the Australian species, whereas those of the third species have compressed antennae, as in *raouli*. The type specimen of [*Cona*] *caelata* White is not to be found in the White collection at the British Museum (Nat. Hist.), and as it was based on a series in White's personal possession (White, 1878 : 275), would appear now to be lost. Both the original generic description and that of the species leave no doubt that the type series included the three forms here recognized as distinct species. Hutton (1898a : 187) interpreted the species as including the forms with hyaline tegmina, more or less clouded with brown. Tillyard (1926d : 167) figured one coelopterous form as a representative of *caelata* White. The writer, in the absence of any information about the existence of a type specimen, and in conformity with Tillyard, here proposes to restrict the specific concept to include only a form with terete antennae, a pronotum with discal carinae gently sinuately bent a little before meeting the posterior margin, laterally trispinose post-tibiae, and tegmina as long as the abdomen.

The forms with slightly compressed antennae and brachypterous tegmina are set apart from the general assemblage of *Ugyops* only by weak characters. The differences are here regarded as being of subgeneric value, and a name for the concept is proposed below.

## *Ugyops caelatus* (White)

(Text-figs. 1–7)

[*Cona*] *caelata* B. White, 1879b : 218.
*Micromasoria caelata* Kirkaldy, 1909h : 29.

Vertex longer submedially than broad at base (nearly 1·3 : 1), broadly and evenly rounding into frons, rather wider at apex than at base, lateral margins shallowly concave, apical margin shallowly convex, with submedian carinae only slightly prominent, Y-shaped carina with median stem obsolete, submedian carinae not uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·5 : 1) ; frons in middle line longer than wide at widest part (nearly 2·3 : 1), widest at about two-sevenths from base, lateral margins shallowly convex, submedian carinae separate to apex ; antennae reaching to level of apex of clypeus, basal segment cylindrical, longer than broad (4·0 : 1), second segment cylindrical, longer than first (about 1·1 : 1). Ocelli minute or obsolete. Pronotum with disc longer in middle line than broad at anterior margin (3·0 : 1), lateral carinae concave, broadly recurved posterolaterally and attaining hind margin.

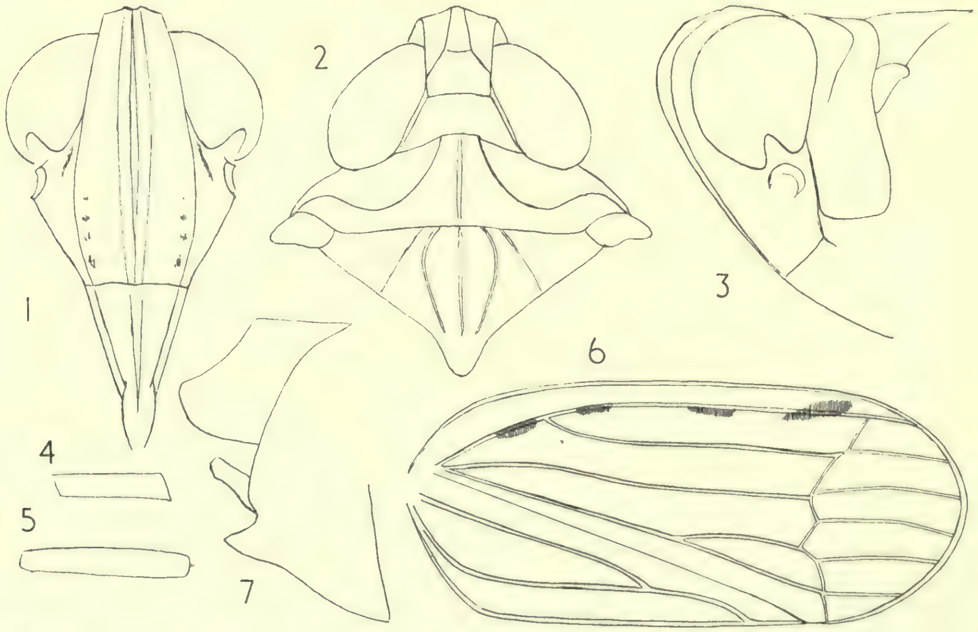
Pale tawny yellow ; submedian carinae and lateral marginal carinae of frons and vertex, anteclypeus, a small mark just below eyes, a spot at apex of first antennal segment, two bands on second segment, a suffusion on each side of pronotum behind eyes, mesonotum laterad of lateral carinae, longitudinal stripes on all femora, and two bands on each protibia and mesotibia, all tarsi, posterior margins of abdominal sterna, and markings sublaterally on terga, posterior half of pygofer, except at margin, and anal segment of male, fuscous ; frons medially, a spot on genae before antennae, pronotum in middle line and on each side behind antennae, and mesonotum in middle line, red. Tegmina brownish hyaline, pale distad of transverse line ; veins ochraceous extensively interrupted with castaneous, sometimes castaneous at node and basally in costal cell.

Anal segment of ♂ with lower margins as seen in ventral view meeting at 90 degrees apically. Pygofer with medioventral process distally broadly rounded and with a small median notch. Genital styles moderately long, strongly tapering distad, weakly diverging and rather abruptly incurved near apex.

♂ (coelopterous) : length, 4·8 mm., tegmen, 4·1 mm. ♀ : length, 6·1 mm., tegmen, 4·5 mm.

New Zealand : Poor Knights Group, Tawhiti Rahi Id., 1 ♂, 21.i.43 (Majors *Buddle* and *Wilson*) ; Kauri G., 1 ♂, 25–i–21 ; Three Kings Group, Great Id., 1 ♂, 4 ♀, 2–10.v.46, beating kanuka, 27.iv.46, in tea tree (*E. G. Turbott*) ; S. W. Id., 1 nymph, 13.i.51, on bushes (*T. E. Woodward*) ; North Auckland, Mangonui, 1 ♂, 8.iii.51 (*T. E. Woodward*) ; Te Paki, 2 nymphs, 21.i.50, on *Leptospermum* ; Auckland, Tikirangi, 1 ♂, 1 nymph, 7.xii.48, 28.xii.44 ; Foxton, 16 ♂, 14 ♀, 1 mutilated specimen, 8.i.50, on *Muehlenbeckia australis* (*T. E. Woodward*), 7.i.50, (*R. A. Cumber*) ; Coromandel, Te Hope stream valley, 6 ♂, 1 mutilated specimen and 9 nymphs, on flowering prostrate rata, 12.i.52 (*T. E. Woodward*) ; behind W. Spirits Bay, 25.i.50, 3 ♂, 2 nymphs, on small-leaved *Muehlenbeckia* (*T. E. Woodward*) ; N. Auckland Pen., 5 ♀, 2 mutilated specimens and 8 nymphs, 1924 (*T. R. Harris*) ; York Bay, 3 nymphs, 3.ix.22, on *Coprosma rhamnoides* (*J. G. Myers*) ; Catchpole, 2 nymphs, on *Knightia excelsa* ; Wilton's Bay, 3 nymphs, 16.iv.21 ; Auckland, Watershed reserve, 1 ♀, 26.ii.48 (*G. Chamberlain*), Waipapakauri, 1 ♀, 30.i.53 (*R. A. Cumber*) ; Houhola, 1 ♂, 16.ii.51 (*R. A. Cumber*).

This species is distinguished from other New Zealand species by the combined characters of trispinose post-tibiae, cylindrical antennae, and gently recurved lateral pronotal carinae. It is also readily recognizable by the narrowly infuscate lateral carinae of the frons.



Figs. 1–7. *Ugyops caelatus* (White). 1, Frons and clypeus ; 2, head and thorax, dorsal view ; 3, head in profile ; 4, basal segment of antenna ; 5, second segment of antennae ; 6, tegmen ; 7, ♂ genitalia, right side.

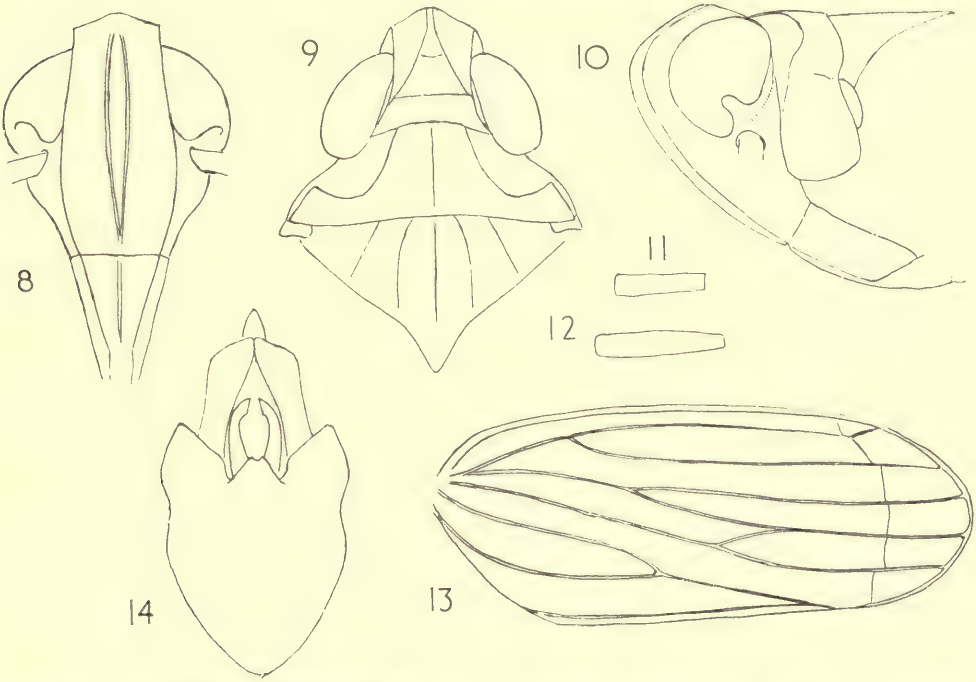
## ***Ugyops rhadamanthus*** **sp. n.**

(Text-figs. 8–14)

Vertex longer submedially than broad at base (1·2 : 1), rather strongly rounding into frons, as wide at apex as at base, lateral margins shallowly concave, apical margin rather strongly convex, with submedian carinae not prominent, Y-shaped carina with median stem weak, submedian carinae almost uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (2 : 1); frons in middle line longer than wide at widest part (nearly 2·3 : 1), widest at one quarter from base, lateral margins shallowly convex. Median carinae uniting just before apex; antennae reaching almost to level of apex of clypeus, basal segment cylindrical, longer than broad (nearly 4·0 : 1), second segment longer than first (1·2 : 1). Ocelli obsolete. Pronotum with disc longer in middle line than broad at anterior margin (1·6 : 1), lateral carinae concave, abruptly and rectangulately recurved postero-laterally and attaining hind margin. Post-tibiae laterally with three teeth.

Stramineous; second antennal segment in apical third, a very dilute suffusion on all coxae, and in two bands on protibiae, abdominal sternites at posterolateral margins, fuscous; post-clypeal disc and frons submarginally, a suffusion on genae before eyes, vertex in middle line apically and at lateral angles basally, pronotum in middle line, and on two areas of lateral lobes, mesonotum in middle line and over lateral carinae, and abdominal terga at posterior margin, red. Tegmina stramineous hyaline, veins concolorous except on posterior claval vein near union of claval veins and at entry into hind margin, where it is overlain fuscous.

Anal segment of ♂ with lower margins as seen in ventral view meeting apically in a very acute



Figs. 8–14. *Ugyops rhadamanthus* sp. n. 8, Frons and clypeus; 9, head and thorax, dorsal view; 10, head in profile; 11, basal segment of antenna; 12, second segment of antenna; 13, tegmen; 14, ♂ genitalia, postero-ventral view.

angle. Pygofer with medioventral process distally narrowly rounded and without a distinct notch. Genital styles moderately long, weakly tapering distad, weakly converging distally.

♂ (coelopterous) : length, 5·3 mm., tegmen, 4·0 mm. ♀ : length, 6·5 mm., tegmen, 5·0 mm.

Holotype ♂, NEW ZEALAND : Auckland, Nihotupu, 2.i.50 (*A. Harrison*), in collection of Plant Diseases Division, D.S.I.R., P.B., Auckland.

Paratypes, Huia, 1 mutilated specimen, 13.iv.50 (*T. E. Woodward*) ; Mocrewa, 1 ♂, 7.i.53 (*R. A. Cumber*) ; Paihia, 2 ♀, 12.i.49, 28.ii.50 (*R. A. Cumber*) ; Kaeo, 1 ♂, 4 ♀, 2, 31.i.53 (*R. A. Cumber*) ; Oturere Sta., Desert Rd., 1 ♀, 3.i.57 (*R. A. Cumber*), Levin, 1 ♀, 26.xi.41 ; Spirits Bay, 1 ♂, 1 nymph, 13.ii.51 (*R. A. Cumber*) ; Little Barrier Id., summit track, 1 ♂, 22.xi.54, Waipawa stream, 1 ♂, 28.xi.54 (*K. A. J. Wise*) ; Titirangi, 1 ♂, 1 ♀, 1 mutilated specimen, 15.ii., 22.iii., 4.iv.42, on kohe kohe tree (*M. Carter*).

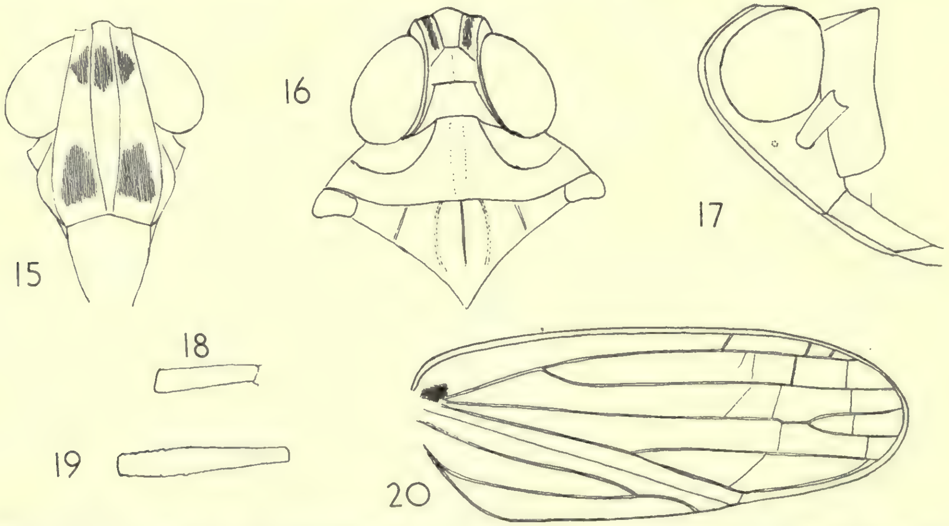
This species is distinguished by the shape of the vertex, by the antennal proportions and by the abruptly angulate bend in the lateral pronotal carinae and, in the ♂, by the shape of the anal segment. Among the New Zealand species its coloration is distinctive : there are practically no obvious fuscous markings, and the frons is red-margined.

### ***Ugyops musgravei*** Muir

(Text-figs. 15–20)

Muir, 1931b : 70.

This species is not represented in the present collection. It is apparently endemic in Lord Howe Island, and the opportunity is here taken of figuring a paratype specimen in the collection of the British Museum (N.H.).



FIGS. 15–20. *Ugyops musgravei* Muir. 15, Frons and clypeus ; 16, head and thorax, dorsal view ; 17, head in profile ; 18, basal segment of antenna ; 19, second segment of antenna ; 20, tegmen.

## *PARACONA* subgen. n.

Frons scarcely twice as long as broad, submedially bicarinate ; antennae reaching to level of apex of clypeus, with apical segment, and sometimes basal also, slightly laterally compressed. Post-tibiae with four spines laterally. Tegmina brachypterous, apical margin truncate.

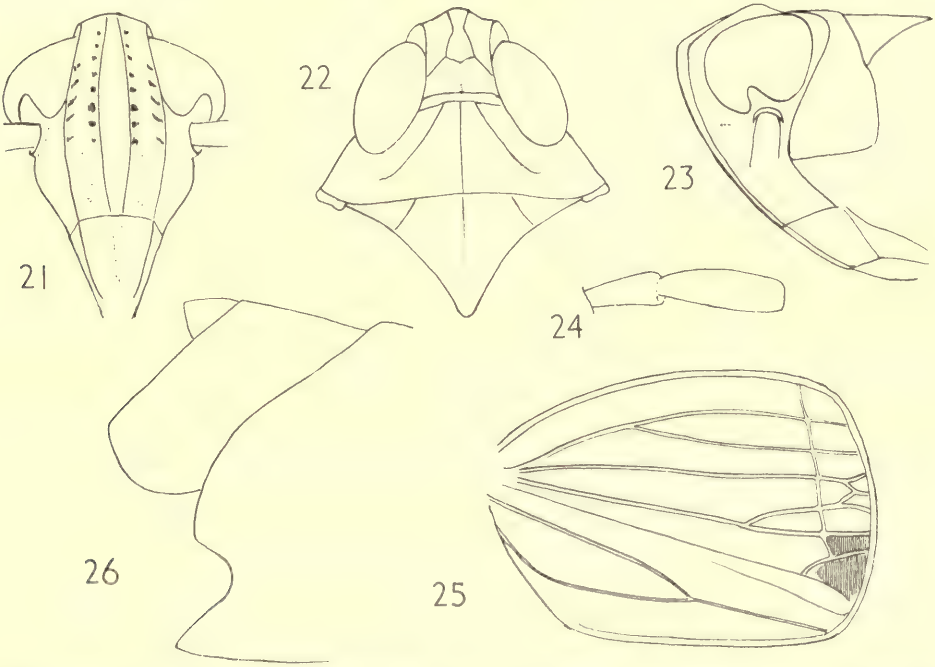
Type-species of subgenus, *Ugyops* (*Paracona*) *pelorus* sp. n.

This subgenus is recognizable by the compressed antennae and quadrispinose post-tibiae.

## *Ugyops (Paracona) pelorus* sp. n.

(Text-figs. 21–26)

Vertex longer medially than broad at base (about 1·4 : 1), subangularly rounding into frons, wider at apex than at base, lateral margins shallowly concave, apical margin sinuately convex with submedian carinae prominent, Y-shaped carina present, with median stem weak, submedian carinae not quite uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (about 1·6 : 1) ; frons in middle line longer than wide at widest part (1·9 : 1), widest at three-fifths from base, lateral margins shallowly convex, submedian carinae separate to apex. Antennae reaching to level of apex of clypeus, basal segment laterally compressed, longer than broad (2·2 : 1), second segment laterally compressed, longer than first (1·5 : 1). Ocelli obsolete. Pronotum with disc longer in middle line than broad at anterior margin (3 : 1),



Figs. 21–26. *Ugyops* (*Paracona*) *pelorus* sp. n. 21, Frons and clypeus ; 22, head and thorax, dorsal view ; 23, head in profile ; 24, antenna ; 25, tegmen ; 26, ♂ genitalia, right side.

lateral carinae concave, obsolete laterobasally, not attaining hind margin, weak paired lateral carinae between eye and tegula on each side.

Light yellowish brown, with pustules and carinae pale stramineous; antennae dilute fuscous; a few small spots bordering submedian carinae in basal half of frons, a band across base of clypeus and extending across procoxae and mesopleura, stripes on all femora, two bands on each protibia and mesotibia, and a suffusion on post-tibiae, castaneous. Intercarinal areas of frons and genae marbled with orange-red; disc and sides of postclypeus, except at base, tawny. Tegmina stramineous, veins irregularly marked pale yellowish brown, three apical cells near anal angle, dark castaneous.

Anal segment of ♂, as seen in ventral view, with ventral margins meeting distally at about 90 degrees, in lateral view as figured. Pygofer with apical margin of medioventral process broadly convex, with a small median notch. Aedeagus as figured. Genital styles moderately long, tapering distad and weakly curved mesad.

♂ (brachypterous): length, 4·0 mm., tegmen, 1·9 mm. ♀ (brachypterous): length, 6·0 mm., tegmen, 2·8 mm.

Holotype ♂, NEW ZEALAND: Ohope beach, 22.i.47, Hem. 149 (*C. R. Pattison*), in Auckland Museum.

Paratypes, NEW ZEALAND: Auckland, 1 ♂, 13.iii.49; Coopers Beach, 1 nymph, 8.i.51; Mt. Mangonui, 1 ♂, 4 nymphs, 23.x.60, under *Muehlenbeckia* (*B. M. May*); Coromandel, Te Hope stream valley, 5 ♂, 1 ♀, on flowering prostrate rata, *Muehlenbeckia australis*; Spirits Bay, 2 ♀, 13.ii.51 (*R. A. Cumber*); W. Bank Pen., Price's Valley, 1 ♀, 18.ii.59 (*T. E. Woodward*); Eastbourne, 1 ♂, 31.i.51 (*R. A. Cumber*); Whangarei Heads, Ocean Beach, 2 ♀, 7.xii.58, under *Muehlenbeckia* (*B. M. May*), 1 ♂, 1 ♀, Three Kings, S.W. Id., 13.i.51 (*T. E. Woodward*).

This species is closely allied to *U. raouli* (Muir), but is readily separable by its more strongly compressed second antennal segment and smaller size; other, less obvious, differences are to be noted in coloration, tegminal venation, and in the form of each element of the ♂ genitalia.

### ***Ugyops (Paracona) raouli*** (Muir)

(Text-figs. 27–32)

*Micromasoria raouli* Muir, 1923: 257.

KERMADEC IS.: Raoul Id., 2 ♂, from nikau fronds (*J. H. S.*)

## ***PSEUDEMBOLOPHORA*** Muir

Muir, 1920b: 182.
Orthotype, *Pseudembolophora macleayi* Muir.

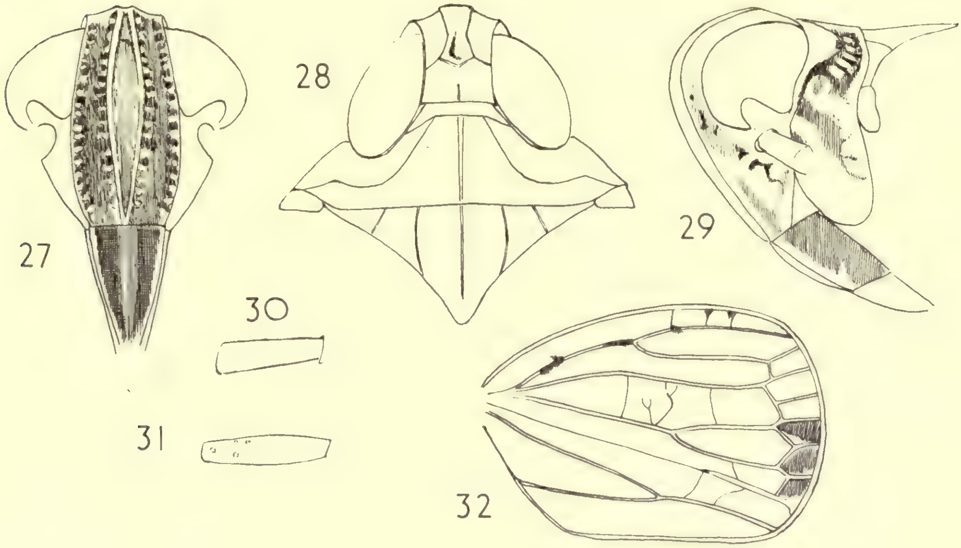
### ***Pseudembolophora macleayi*** Muir

Muir, 1920b: 183.

AUSTRALIA: Maida Vale, near Perth, 1 ♀, 29.viii.59 (*T. E. Woodward*).

## ***TROPIDOCEPHALA*** Stål

Stål, 1853b: 266.
Haplotype, *Tropidocephala flaviceps* Stål, 1855a: 93.



FIGS. 27–32. *Ugyops* (*Paracona*) *raouli* (Muir). 27, Frons and clypeus ; 28, head and thorax, dorsal view ; 29, head in profile ; 30, basal segment of antenna ; 31, second segment of antenna ; 32, tegmen.

## ***Tropidocephala eximia*** (Kirkaldy)

*Ectopiopterygodelphax eximius* Kirkaldy, 1906c : 412.

AUSTRALIA : Brisbane, 1 ♂, 1 ♀, 30.vi.57 (*Haseler*).

## ***Tropidocephala dryas*** Kirkaldy

Kirkaldy, 1907d : 143.

AUSTRALIA : Mt. Nebo, 1 ♂, 2.vi.54 (*N. Jenkins*).

## ***HAERINELLA*** **gen. n.**

Head narrower than pronotum. Vertex shorter medially than broad at base, obtusely rounding into frons, narrower at apex than at base, lateral margins straight or very weakly concave, apical margin truncate, with submedian carinae not prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (more than 2 : 1) ; frons in middle line longer than wide at widest part (nearly 2 : 1), widest near middle, lateral margins distinctly convex, median carina simple, clypeus at base distinctly wider than frons at apex, postclypeal disc slightly longer than broad at base, in profile moderately convex, anteclypeus in profile shallowly convex ; entire clypeus in profile doubly convex ; rostrum slightly surpassing mesotrochanters, apical segment a little shorter than subapical ; antennae little, if at all, surpassing frontoclypeal suture, basal segment as long as broad, strongly expanded distally, not carinate on the flattened surface, and scarcely so at edges, second segment longer than first (about 1·7 : 1) distinctly compressed ; ocelli well developed. Pronotum with disc shorter in middle line than broad at anterior margin, lateral carinae straight or weakly convex, not quite attaining hind margin. Total length of mesonotum longer than that of scutellum (about 2·3 : 1). Post-tibial spur cultrate, concave on inner surface with an apical tooth and no lateral teeth.

Tegmina narrowly rounded at apex, apical veins of *Sc*, *R* and $M_1$ recurved to margin, radial cross vein present, first median sector abruptly bent at nodal line to touch $Cu_{1a}$.

Type-species, *Haerinella saeva* sp. n.

There are only two tropidocephaline genera with a compressed basal antennal segment, and these are *Bambucibatus* and *Belocera*. From *Bambucibatus*, which is known only from the type-species, *B. albolineatus* Muir (1915e : 319), the present genus differs in the lateral carinae of the vertex not being " large " (in consequence of the depression of the vertex) and the mediolongitudinal carina (the common stem of the Y-shaped carina) being quite distinct ; in the length of the frons not being more than twice the width, and the width at the base being greater, not less, than that at the apex ; in the basal segment of the antennae not having " a keel down middle " and in being much less expanded and the second segment being compressed, not terete, and with a carina on the ventral margin in its basal two-thirds ; and in the spur, though moderately thick, being concave on the inner surface. From *Belocera* it is distinguishable by the narrower form of the frons and of the basal antennal segment.

### *Haerinella saeva* sp. n.

(Text-figs. 33–38)

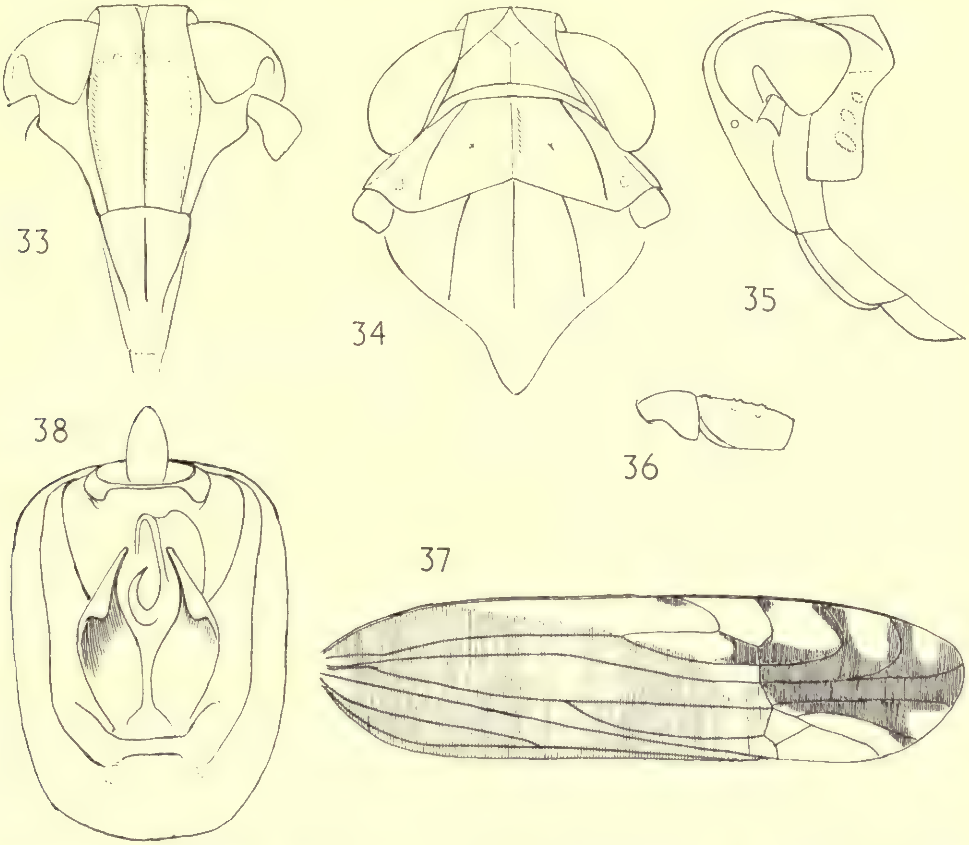
Vertex shorter medially than broad at base (1 : 1·9), slightly declivous, obtusely rounding into frons, narrower at apex than at base, apical margin truncate, Y-shaped carina distinct, submedian carinae uniting at apex of vertex, meeting almost at a right angle, basal compartment of vertex wider at hind margin than greatest length (2·6 : 1), and than median length (3·8 : 1) ; frons in middle line longer than wide at widest part (1·8 : 1) ; widest at about two-fifths from base, lateral margins distinctly convex, median carina simple ; clypeus at base distinctly wider than frons at apex, post-clypeal disc rather longer than broad at base (1·2 : 1) in profile rather strongly convex, anteclypeus in profile moderately convex ; entire clypeus in profile doubly convex ; antennae with basal segment as long as broad, laterally compressed, ecarinate, second segment longer than first (about 1·7 : 1) ; pronotum with disc shorter in middle line than broad at anterior margin (1 : 1·1) lateral carinae weakly convex, almost attaining hind margin. Total length of mesonotum longer than that of scutellum (2·3 : 1) ; post-tibial spur with small apical tooth.

Castaneous-piceous ; two small spots on frons near base, vertex, disc of pronotum and mesonotum except for a suffusion near tegulae, rostrum, legs except coxae, abdominal sternites, except in their anterior portion, posterior margin of pygofer, genital styles in basal half, and anal segment, stramineous. Tegmina hyaline, a broad band from tegula to apex of tegmen and a narrow line on one or both sides of apical veins of *Sc*, *R* and $M_1$, castaneous-fuscous, posterior half of tegmen with a faint yellowish tinge ; veins concolorous. Wings hyaline, sordid white or faintly infused, veins fuscous.

Anal segment of ♂ very short, ring-like, lateroapical angles rounded, not produced. Pygofer moderately long, posterior opening longer dorsoventrally than broad, dorsolateral angles not at all produced, diaphragm with dorsal margin deeply concave, medioventral process present as a broad callus. Genital styles moderately long, rather broad and flattened in basal half, twisted and tapering mesodorsad in distal half.

♂ : length, 3·3 mm., tegmen, 4·4 mm.

Holotype ♂, NEW GUINEA: Central Highlands, Daulo Pass, *c.* 8,000 ft., 20–22. viii.56 (*T. E. Woodward*), in Queensland Museum, Brisbane.



FIGS. 33–38. *Haerinella saeva* sp. n. 33, Frons and clypeus; 34, head and thorax, dorsal view; 35, head in profile; 36, antennae; 37, tegmen; 38, ♂ genitalia, posterior view.

## *TEMENITES* gen. n.

Vertex shorter medially than broad at base (not quite 2 : 1), obtusely rounding into frons, rather narrower at apex than at base, lateral margins straight or weakly concave, apical margin transverse, with submedian carinae slightly prominent, Y-shaped carina distinct, submedian carinae not uniting on vertex, basal compartment of vertex wider at hind margin than greatest length; frons in middle line longer than wide at widest part (nearly 2 : 1), widest near middle, lateral margins convex, median carina rather widely forked near middle; clypeus at base wider than frons at apex, postclypeus short, about as long as basal antennal segment; rostrum with apex lying between mesotrochanters; antennae moderately surpassing frontoclypeal suture, basal segment little longer than broad, laterally compressed, expanding distad, second segment longer than first, with a shallow sulcus near lower margin; ocelli reduced or obsolete. Pronotum with disc shorter in middle line than broad at anterior margin, lateral carinae straight, not attaining hind margin. Post-tibial spur tectiform, with about 18 teeth.

Anal segment of ♂ short, lateroapical angles widely separated, each produced ventrally in a spinose process. Pygofer moderately long; no medioventral process present on hind margin.

Type-species, *Temenites ancon* sp. n.

### *Temenites ancon* sp. n.

(Text-figs. 39–43)

Vertex shorter submedially than broad at base (about 1·8 : 1), obtusely rounding into frons, hollowed between carinae, submedian carinae not uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (3·0 : 1) and than median length (4 : 1); frons in middle line longer than wide at widest part (nearly 2 : 1), widest at level of lower margin of eyes, lateral margins convex, median carina rather widely forked at level of lower margin of eyes, clypeus at base distinctly wider than frons at apex, in profile strongly convex, postclypeal disc shorter than broad at base (1 : 1·2), anteclypeus in profile strongly curved caudad so that entire clypeus in profile is strongly bilobately convex; antennae reaching approximately to level of middle of clypeus, basal segment scarcely longer than broad (1·1 : 1), laterally compressed, expanding distad; second segment longer than first (1·8 : 1) with a shallow sulcus near lower margin; ocelli represented only by a scar. Pronotum with disc shorter in middle line than broad at anterior margin (about 1 : 2) lateral carinae straight, not attaining hind margin. Post-tibial spur not elongate, with 18 teeth.

Castaneous-piceous; frons, vertex, pronotum, mesonotum, femora apically, tibiae except post-tibiae near base, and tarsi, stramineous; clypeus, genae, most of first antennal segment and basal half of second, brownish-yellow; abdominal tergites laterally orange or pale brown; genital styles and median portion of diaphragm yellowish brown. Tegmina (brachypterous) castaneous-piceous, except at apical margin, which is whitish hyaline, veins concolorous except for a few irregular veinlets near apical margin, which are pale.

Anal segment of ♂ short, broader than long, latero-apical angles very widely separated, each produced ventrally in a stout process incurved mesad and acuminate distally. Pygofer with posterior opening as broad as long, dorso-lateral angles little produced, lateral margins in profile convex, diaphragm with dorsal margin very deeply excavate, middle portion very short, in form of a polished horizontal plate, medioventral process absent. Aedeagus long, stout, porrect, strongly compressed laterally, ornamented near dorsal and ventral margins on both sides with irregular coarse teeth; orifice on right near apex; a long stout rodlike process arising at base of aedeagus, directed ventro-caudad and slightly surpassing diaphragm, narrowly bifurcate apically. Genital styles rather long, each slightly curved and twisted, shallowly expanding to middle, where the inner margin bears a small stout spine, thence tapering to a slender process at apex, weakly curved laterad at tip.

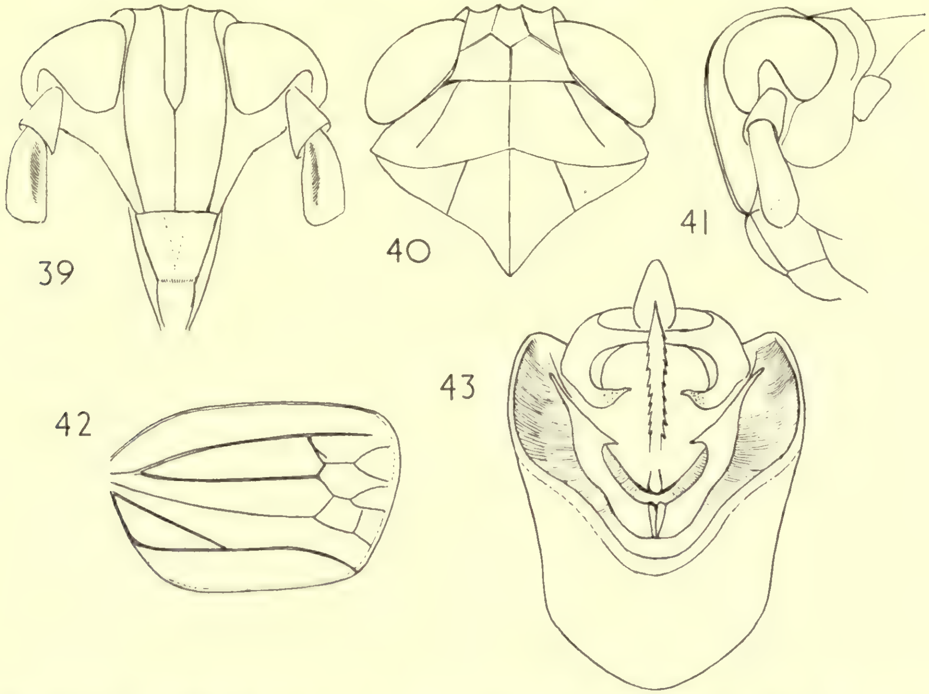
♂ (brachypterous): length, 2·8 mm.

Holotype ♂, AUSTRALIA: Brisbane, 30.iii.56 (*Kirkpatrick*), in Queensland Museum.

*Temenites* appears to be allied to *Perkinsiella* and *Phacalastor*, but is separable by the characters given in the key. In addition it differs from both quite markedly in the structure of the ♂ genitalia.

### ***PERKINSIELLA*** Kirkaldy

Kirkaldy, 1903b: 179.
Orthotype, *Perkinsiella saccharicida* Kirkaldy.



FIGS. 39–43. *Temenites ancon* sp. n. 39, Frons and clypeus; 40, head and thorax, dorsal view; 41, head in profile; 42, tegmen; 43, ♂ genitalia, posterior view.

### ***Perkinsiella saccharicida*** Kirkaldy

Kirkaldy, 1903b : 179.

AUSTRALIA: N. Queensland, Ayr Distr., Claredale, 1 ♂, 3 ♀, 36.v.53, on maize (*T. E. Woodward*); Ayr, 1 ♂, 1 ♀, 1.xii.54. 3.iv.55 (*G. Saunders*); Atherton, 2 ♂, 17.v.54 (*G. Saunders*); Brisbane, 1 ♀, 24.iii.41 (*V. B. D. Sherman*); N. Queensland, Don R. (near Bowen), 1 ♂, 28.v.53 (*T. E. Woodward*).

### ***PHACALASTOR*** Kirkaldy

Kirkaldy, 1906c : 404.

Orthotype, *Phacalastor pseudomaidis* Kirkaldy.

### ***Phacalastor pseudomaidis*** Kirkaldy

Kirkaldy, 1906c : 404.

AUSTRALIA: Binna Burra, 1 ♂, 7.iv.54 (*S. Sekhon*).

### ***PELIADES*** Jacobi

Jacobi, 1928a : 43.

Orthotype, *Peliades platypoda* (Bierman), 1910a : 42.

### *Peliades phyllocnemis* sp. n.

(Text-figs. 44–50)

Vertex broader at base than long submedially (1·3 : 1), obtusely rounding into frons, rather narrower at apex than at base, lateral margins slightly concave, apical margin truncate, with submedian carinae not prominent, Y-shaped carina distinct, submedian carinae uniting near middle of frons, basal compartment of vertex wider at hind margin than greatest length (2·4 : 1) and than median length (2·8 : 1) ; frons in middle line longer than wide at widest part (1·8 : 1), widest just below level of eyes, lateral margins concave between eyes, straight distally and converging slightly towards frontoclypeal suture, median carina forked near middle ; clypeus at base distinctly wider than frons at apex, postclypeal disc as long as broad at base, in profile moderately convex, anteclypeus in profile rather strongly convex, curved caudad, so that entire clypeus in profile is rather strongly convex ; antennae reaching to level of apex of postclypeus, basal segment longer than broad (3 : 1), second segment longer than first (1·6 : 1). Pronotum with disc as broad at anterior margin as long in middle line ; lateral carinae weakly concave, strongly diverging, not attaining hind margin. Post-tibial spur with 29 teeth.

Castaneous-piceous ; carinae of basal half of frons, vertex, pronotal disc and carinae, mesonotal disc and carinae, hind margins of anterior abdominal terga and median portion of the last three, posterior margin and laterodorsal angles of pygofer, lateral lobes of pronotum, rostrum, femora at apex, pro- and mesotibiae at apex, testaceous ; some spots on frons, an irregular suffusion on disc of clypeus, and hind tarsi, ferruginous. Tegmina (brachypterous) castaneous piceous, clavus creamy yellow to ochraceous, a fascia from node to apex of clavus, creamy white ; veins concolorous, in clavus beset with fuscous-piceous granules. Anal style black.

Anal segment of ♂ short, ring-like, lateroapical angles not produced. Pygofer short, longer ventrally than dorsally, posterior opening longer than broad, dorsolateral angles strongly inflected, subrectangulate, diaphragm very broad, with dorsal margin deeply concave, strongly incised medially ; medioventral process present, in form of an acuminate median lobe flanked by two smaller lobes, each bluntly pointed. Aedeagus long, narrow, reflected cephalad distally. Genital styles moderately long, directed dorsad, diverging dorso-laterad in apical third, deeply rounded apically.

♂ (brachypterous) : length, 3·0 mm.

Holotype ♂, New Guinea : West Highlands, Al Valley, *c.* 6,000 ft., 25.viii.56 (*T. E. Woodward*), in Queensland Museum.

This species differs from *P. platypoda* in having a relatively shorter frons in relation to its width, a relatively shorter clypeal disc in relation to its basal width, in both segments of the antennae being thicker in relation to their length, in the greatest width of the foliate protibiae occurring just basad of the middle (as opposed to just distad of the middle in *platypoda*) and in the profemora being deeply infuscate, not pale testaceous as in *platypoda*. The writer has not had an opportunity of comparing the ♂ genitalia.

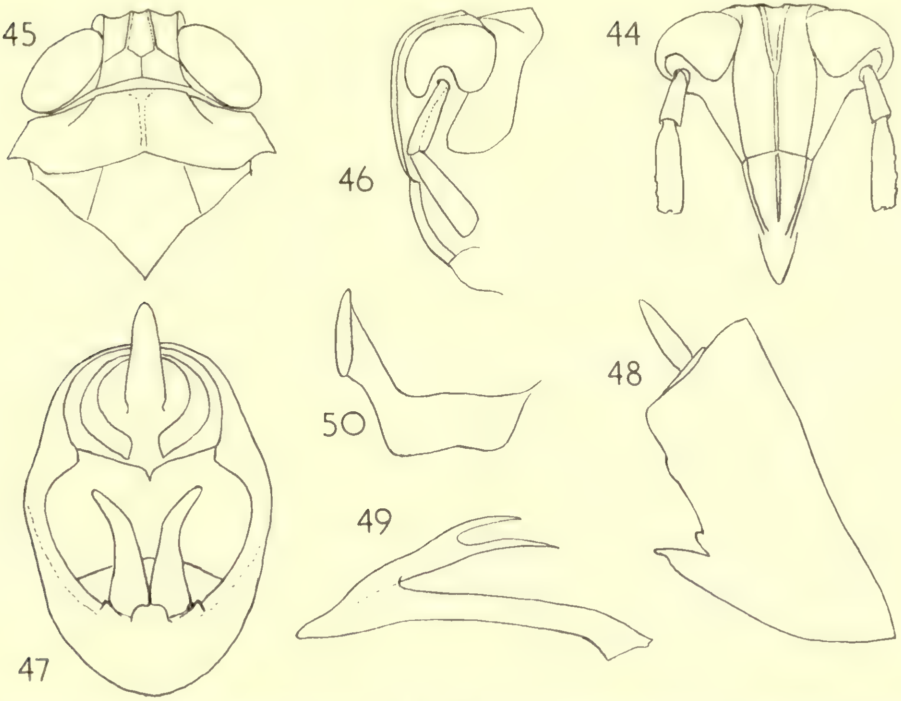
## ***PEREGRINUS*** Kirkaldy

Kirkaldy, 1904a : 175.
Orthotype, *Delphax maidis* Ashmead.

### *Peregrinus maidis* (Ashmead)

*Delphax maidis* Ashmead, 1890a : 323.

Australia : Queensland, Ayr, Demesne area, 1 ♂, 26.v.53 (*T. E. Woodward*), 1 ♀, 3.iv.55 (*G. Saunders*) ; Belmont, 1 ♀, 9.vi.57 ; Sunnybank, 1 ♀, 14.iii.57



FIGS. 44–50. *Peliades phyllocnemis* sp. n. 44, Frons and clypeus ; 45, head and thorax, dorsal view ; 46, head in profile ; 47, ♂ genitalia, posterior view ; 48, anal segment and pygofer, right side ; 49, aedeagus, right side ; 50, genital style.

(*Haseler*) ; Brisbane, 1 ♂, 2 ♀, 3.iii.51 (*G. Saunders*), 7.ix.55 (*L. Jackson*), iii.57 (*S. Sekhon*) ; Cleveland, 1 mutilated specimen, 24.iv.56 (*W. Yarrow*) ; Gaythorn, 1 ♀, 15.iii.47 (*A. R. Bird*) ; Taroom, 1 ♀, 30.iv.29, 6737.

## ***CEMUS*** Fennah

Fennah, 1964 : 147.

### ***Cemus kirkaldyi*** (Metcalf) **comb. n.**

*Phacalastor koebelei* Kirkaldy, 1906c : 408.
*Phyllodinus kirkaldyi* Metcalf, 1943 : 148.

Vertex broader at base than long submedially (about 1·3 : 1), obtusely rounding into frons, rather narrower at apex than at base, lateral margins shallowly concave, apical margin truncate, with submedian carinae weakly prominent, Y-shaped carina feeble, submedian carinae uniting on frons near middle, basal compartment of vertex wider at hind margin than greatest length (2·7 : 1) and than median length (3·5 : 1) ; frons in middle line longer than wide at widest part (nearly 2 : 1), widest at level of lower margin of eyes, lateral margins concave between eyes, straight, slightly converging to fronto-clypeal suture, median carina forked in basal half, simple in distal half, clypeus at base a little wider than frons at apex, postclypeal disc as broad at base as long, in profile rather strongly convex, anteclypeus in profile distinctly convex, so that entire clypeus in profile is rather strongly convex, antennae distinctly surpassing frontoclypeal suture, basal segment longer than broad (2 : 1), second segment longer than first (1·7 : 1). Pronotum with disc broader at anterior margin than long in middle line (1·6 : 1) ; lateral carinae concave not nearly attaining hind margin. Post-tibial spur with about 22 teeth.

Castaneous to piceous ; carinae of vertex, frons, clypeus, some spots on frons and genae, disc of pronotum except for two impressions, lateral fields of pronotum, carinae of mesonotal disc and lateral margins of mesonotum, abdominal terga laterally, anal segment and posterior margins of pygofer, rostrum, femora and tibiae at base and apex, post-tarsi at apex, stramineous ; antennae with an obscure stripe on basal segment, and clypeus, testaceous. Tegmina hyaline, dilutely suffused fuscous, darker near apex of costal margin, submarginally between veins at apex, and in two spots on commissural margin ; veins pale, greyish white, with fuscous-piceous granules.

Anal segment of ♂ short, ring-like, lateroapical angles each produced in a short, rather slender spinose process. Pygofer short, longer ventrally than dorsally, posterior opening rather small, longer than broad, diaphragm rather narrow ; medioventral process present in form of a convex lobe. Aedeagus tubular, rather compressed, reflected at apex cephalad in a long flagellum acuminate at apex. Genital styles rather long, slender, sinuately tapering and acuminate at tip.

♂ (brachypterous) : length, 2·8 mm.

AUSTRALIA : Brisbane 1 ♂, 19.viii.56 (*J. Martin*) ; Ayr, 1 ♂, 20.x.55 (*G. Saunders*) ; N. Ward, T.V., 2 ♀, 16.iv.34 ; S. Mackay, Lotus Ck., *c.* 100 m., 1 ♀, 2.vi.56, on grass, (*I. C. Yeo*) ; Moggill, 1 ♂, 7.v.55, sweeping grass (*T. E. Woodward*) ; Bundaberg, 1 ♀, 10.vi.56, on grass (*I. C. Yeo*) ; Toowang, 1 ♀, 6.iv.41, 6875.

## ***THYMALOPS* gen. n.**

Vertex longer medially than broad at base, subacutely rounding into frons, narrower at apex than at base, lateral margins straight or slightly concave, apical margin convex-truncate with submedian carinae weakly prominent, Y-shaped carinae moderately distinct, submedian carinae not uniting on vertex, basal compartment of vertex wider at hind margin than greatest length (about 1·8 : 1) ; frons in middle line longer than wide at widest part (about 2 : 1), widest at middle, lateral margins weakly convex, median carinae forked at level of lower margin of eyes ; clypeus at base not wider than frons at apex, postclypeal disc slightly longer than broad at base, in profile shallowly convex, anteclypeus in profile shallowly convex ; entire clypeus in profile evenly moderately convex ; rostrum surpassing mesotrochanters but not attaining post-trochanters ; antennae attaining frontoclypeal suture, basal segment cylindrical, widening distad, slightly longer than broad at apex, second segment longer than first (about 1·8 : 1) ; ocelli distinct. Pronotum with disc slightly longer in middle line than broad at anterior margin, lateral carinae straight or weakly concave, not quite attaining hind margin. Femora and tibiae of fore and middle legs not foliate ; post-tibial spur with about 21 teeth.

Type-species, *Dicranotropis anderida* Kirkaldy.

This genus is distinguished by the combination of characters given in the key.

### ***Thymalops anderida*** (Kirkaldy) **comb. n.**

(Text-figs. 51–53)

*Dicranotropis anderida* Kirkaldy, 1907d : 133.

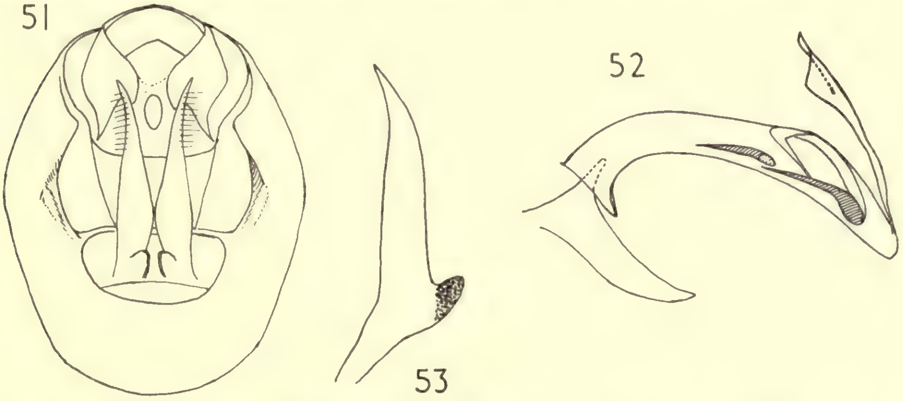
Anal segment of ♂ collar-like, moderately long. Pygofer with posterior opening longer dorsoventrally than broad, diaphragm deep at middle, without ornamentation ; a shallow rounded median process present on ventral margin of pygofer. Aedeagus moderately long, with a reflected flagellum apically. Genital styles simple.

AUSTRALIA: Queensland, Gordonvale, 1 ♂, 16.ii.36, at light (*R. W. Mungomery*). The writer has also seen specimens of this species from Taiwan.

Muir (1917d : 336), on the basis of material from the Philippines, South China, Java and Ceram, placed this species in *Delphacodes* and later (1919a : 7) transferred it to *Nilaparvata* and suppressed it in synonymy under *Liburnia sordescens* (Motsch.). The type-specimen of *Dicranotropis anderida*, however, does not have lateral spines on the basal segment of the post-tarsus, and the frontal carina is bifurcate in its basal half, and so this species cannot be placed in *Nilaparvata*. In dorsal view the shape of the head and thorax is rather similar to that found in *Nilaparvata lugens* Stål (= *L. sordescens* (Motsch.)), and this similarity may account for Muir's action.

## *APLANODES* gen. n.

Vertex slightly shorter medially than broad at base, weakly declivous, obtusely rounding into frons, a little narrower at apex than at base, lateral margins straight, or nearly so, apical margin convex-truncate with submedian carinae not prominent, Y-shaped carina present, submedian carinae approximated at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (approximately 2·7 : 1); frons in middle line longer than wide at widest part (about 2 : 1), widest near middle, lateral margins very weakly convex, a pair of submedian carinae, obscure at base, parallel, extending to frontoclypeal suture; clypeus at base as wide as frons at apex, postclypeal disc about as long as broad at base, in profile very weakly convex, anteclypeus in profile shallowly convex; entire clypeus in profile shallowly convex; rostrum not quite reaching to post-trochanters, apical and subapical segments about equal in length; antennae terete, extending a little beyond frontoclypeal suture, basal segment longer than broad (about 2 : 1), second segment longer than first (about 2 : 1), ocelli well developed. Pronotum with disc as long in middle line as broad at anterior margin, lateral carinae straight, not attaining hind margin, total length of mesonotum longer than that of scutellum (about 2·6 : 1). Post-tibial spur tectiform, not long, with 15–18 minute teeth. Tegmina with $Sc + R$ fork and $Cu_1$ fork much distad of level of union of claval veins, and rather close to nodal line.



FIGS. 51–53. *Thymalops anderida* (Kirkaldy). 51, ♂ genitalia, posterior view; 52, aedeagus, left side; 53, genital style.

Type-species, *Criomorphus australiae* Kirkaldy.

This species runs to *Criomorphus* in Muir's key (1915d : 296) but differs generically in having relatively longer antennae, a differently shaped head, the post-tibial calcar toothed along the margin, and a radically different conformation of the ♂ genitalia. From *Notohyus*, to which superficially it would seem to be nearest, it is well separated by the shape of the head, the proportions of the antennae, the presence of ocelli, the length of the rostrum, and, in the ♀, by the sclerotized pregenital sternite.

## ***Aplanodes australiae*** (Kirkaldy) **comb. n.**

(Text-figs. 54–64)

*Criomorphus australiae* Kirkaldy, 1907d : 131.

Anal segment of ♂ rather large, apical margin transverse, lateroapical angle of left side strongly produced ventrad in a stout subspinose process. Pygofer rather long, dorsolateral angles not produced, lateral margins in profile convex ; diaphragm with dorsal margin deeply concave, narrow in middle portion, and strongly produced caudad in a pair of spinose processes, which are closely apposed basally but diverge moderately towards apex ; no medioventral process present. Aedeagus long, porrect caudad, slightly deflexed at tip, a small tooth dorsally near middle, a row along middle of right side, and a few ventro-laterally on right ; orifice ventrally at apex, rather long. Genital styles moderately long, rather narrow and tapering, directed dorsad and upcurved apically, outer margin shallowly convex, inner margin concave with a small bluntly angulate eminence in distal third.

Seventh (pregenital) sternite of ♀ relatively large, horse-shoe shaped, flattened dorsoventrally, each limb acute at apex. First valvifers, as exposed in ventral view, narrow, of approximately equal width throughout, not at all produced mesad at base.

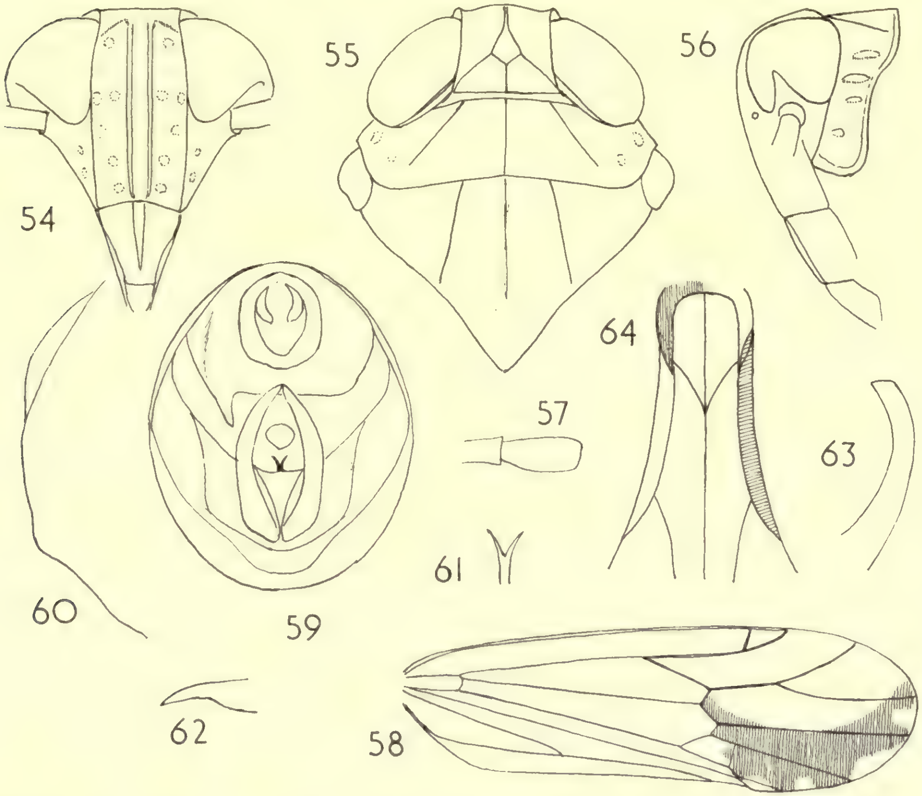
AUSTRALIA : Brisbane, Gold Creek, 1♀, 17.iv.56 (*T. E. Woodward*) ; 1 ♂, 6747. Topotype in Queensland Museum, Brisbane.

## ***NOTOHYUS*** **gen. n.**

Vertex about as long medially as broad at base, horizontal, strongly rounding into frons, about as wide at apex as at base, lateral margins almost straight, apical margin shallowly convex, with submedian carinae not prominent, Y-shaped carina very feeble, submedian carinae approximated at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (about 2 : 1) ; frons in middle line rather longer than wide at widest part (about 1·3 : 1), widest near middle, lateral margins convex, a pair of submedian carinae, obscure basally, extending to frontoclypeal suture, clypeus at base wider than frons at apex, postclypeal disc very approximately as long as broad at base, entire clypeus in profile convex ; rostrum attaining mesotrochanters ; antennae moderately surpassing frontoclypeal suture, basal segment not longer than broad, second segment longer than first (between 2 : 1 and 3 : 1) ; eyes reniform, ocelli absent. Pronotum with disc shorter in middle line than broad at anterior margin, lateral carinae straight or weakly concave, not quite attaining hind margin. Post-tibial spur very short and thick, with minute teeth on margin.

Type-species, *Notohyus erosus* sp. n.

This genus runs to *Criomorphus* in Muir's key (1915d : 296) but differs in having the antennae relatively longer, the head of a different shape, with the carinae



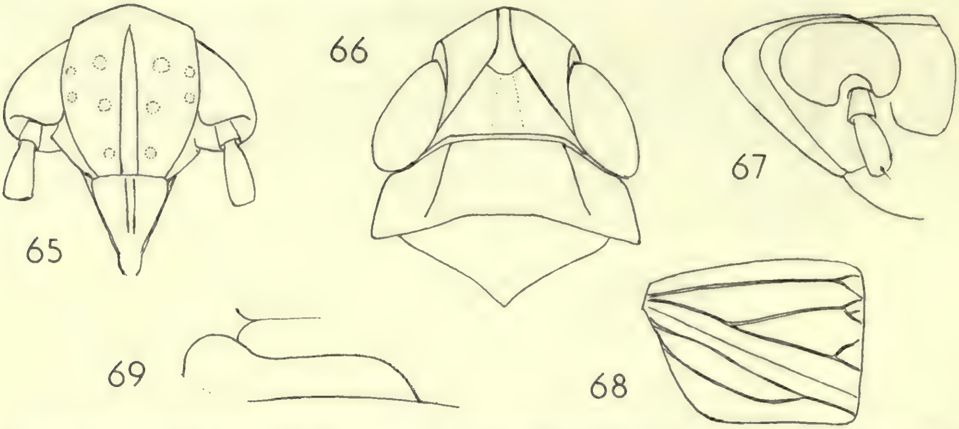
FIGS. 54–64. *Aplanodes australiae* (Kirkaldy). 54, Frons and clypeus ; 55, head and thorax, dorsal view ; 56, head in profile ; 57, antenna ; 58, tegmen ; 59, ♂ genitalia, posterior view ; 60, ♂ genitalia, right side ; 61, process at middle of dorsal margin of diaphragm ; 62, apex of aedeagus ; 63, genital style ; 64, basal portion of ovipositor, ventral view, with horse-shoe shaped pregenital sternite at base demarcated in one half by vertical shading, and one of first valvifers demarcated by oblique shading.

approximated at the base, the post-tibial calcar toothed along the margin, and the first valvifers with the inner margin devoid of any trace of a lobe at middle.

## *Notohyus erosus* sp. n.

(Text-figs. 65–69)

Vertex as long medially as broad at base, strongly rounding into frons, as wide at apex as at base, lateral margins very shallowly concave, apical margin distinctly convex, with submedian carinae obscure, not prominent, Y-shaped carina very feeble or obsolete, submedian carinae approximated at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (about 2 : 1) ; frons in middle line longer than wide at widest part (nearly 1·3 : 1), widest at middle, lateral margins strongly convex, a pair of parallel submedian carinae, obscure and apparently united at base, reaching frontoclypeal suture, clypeus at base distinctly wider



FIGS. 65–69. *Notohyus erosus* sp. n. 65, Frons and clypeus ; 66, head and thorax, dorsal view ; 67, head in profile ; 68, tegmen ; 69, first valvifer of ovipositor (caudad to right).

than frons at apex, postclypeal disc shorter in middle than broad at base (1 : 1·1), in profile recessed below level of frons, and moderately convex, median carina broadly obscure, anteclypeus in profile more weakly convex ; rostrum attaining mesotrochanters, subapical segment moderately compressed laterally, rather longer than apical segment ; antennae reaching to level of middle of post-clypeus, basal segment scarcely as long as broad, second segment longer than first (2·7 : 1) ; ocelli absent. Pronotum with disc shorter in middle line than broad at anterior margin (1 : 1·5), median carina obsolete, lateral carinae weakly concave, not quite attaining hind margin ; mesonotum (brachypterous form) with carinae very feeble or obsolete. Post-tibial spur very short and thick, with a broad pad, a distinct apical tooth and about twenty-two very minute teeth.

Light testaceous ; frons, except for six round spots in each compartment of disc, genae near anterior margin, some incomplete longitudinal stripes on femora and tibiae, and abdominal sternites in part, rather dilute yellowish fuscous ; metapleura, six small spots on each abdominal tergum, and second valvifers of ovipositor apically, castaneous-piceous. Tegmina stramineous hyaline, veins concolorous and rather obscure.

First valvifers of ovipositor each produced mesad at base in a rather shallow rounded lobe, inner margin distad of this lobe entire.

♀ (brachypterous) : length, 4·1 mm.

Holotype ♀, NEW ZEALAND : Banks Peninsula, Tumbledown Bay, 18.ii.59 (*T. E. Woodward*), in collection of Entomology Division, D.S.I.R., Nelson.

## *NILAPARVATA* Distant

Distant, 1906i : 473.
Orthotype, *Nilaparvata greeni* Distant.

### ***Nilaparvata lugens*** (Stål)

*Delphax lugens* Stål, 1854b : 246.
*Nilaparvata greeni* Distant, 1906i : 473.

AUSTRALIA : Sunnybank, 3 ♂, 16, 19.iii.57, 21.iv.57 (*Haseler*) 1 ♂, 15.ii.51

(*S. Barker*) ; Lawes, 1 ♀, 8.xii.56 (*W. F. Wildin*) ; Brisbane, 4 ♀, 21, 31.iv.57 (*S. Sekhon*) ; 20.xi.1955 (*G. E.*), 9.iii.57 (*B. R. Grant*).

NEW GUINEA : W. Highlands, Al Valley, *c.* 6000 ft., 1 ♀, 25.viii.56 (*T. E. Woodward.*)

### ***Nilaparvata myersi*** Muir

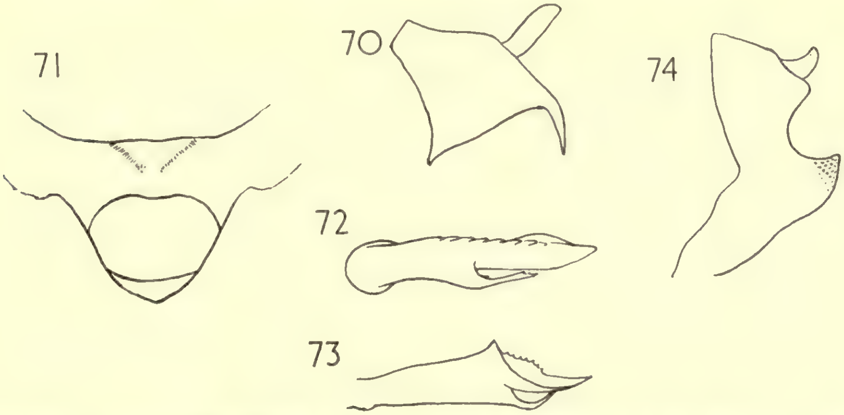
(Text-figs. 70–74)

Muir, 1923i : 258.

Vertex longer submedially than broad at base (1·2 : 1) subacutely and abruptly rounding into frons, distinctly narrower at apex than at base, lateral margins almost straight, apical margin truncate with submedian carinae prominent, Y-shaped carina well developed, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·5 : 1) and than median length (1·7 : 1) ; frons in middle line longer than wide at widest part (2 : 1), widest at middle, lateral margins shallowly convex, median carina simple or at most forked only at extreme base ; clypeus at base wider than frons at apex, postclypeal disc as broad at base as long, in profile moderately convex, anteclypeus in profile rather strongly convex so that entire clypeus in profile is rather strongly interruptedly convex or biconvex ; antennae moderately surpassing fronto-clypeal suture, basal segment longer than broad (about 1·7 : 1), second segment longer than first (1·5 : 1) ; ocelli small. Pronotum with disc longer in middle line than broad at anterior margin (nearly 1·3 : 1), lateral carinae concave, diverging laterad, not attaining hind margin. Post-tibial spur with 19 teeth.

Stramineous ; vertex, pronotal disc, mesonotum, paler ; fifth to seventh abdominal terga, piceous except in middle line, eighth tergum piceous near margin, pygofer castaneous-piceous except at dorsolateral angles, genital styles and diaphragm piceous.

Anal segment of ♂ moderately long, distinctly broad, lateroapical angles widely separated, each produced ventrad in a curved spinose process. Pygofer moderately long, posterior opening about as broad as long, dorsolateral angles not produced caudad, inflected mesad ; diaphragm with dorsal margin weakly convex, medioventral process absent. Aedeagus moderately long, straight, with about seven teeth along dorsal margin ; a long narrow process arising ventrally near middle and extending caudad below main axis of aedeagus and parallel to it. Genital styles



FIGS. 70–74. *Nilaparvata myersi* Muir. 70, Anal segment of ♂, left side ; 71, median portion of diaphragm ; 72, aedeagus, ventral view ; 73, aedeagus, left side ; 74, genital style.

moderately long, stout, in posterior view each asymmetrically Y-shaped, strongly produced caudad near base; process of inner apical angle strongly curved cephalad.

♂ (brachypterous): length, 3·5 mm. ♀ (brachypterous): length, 3·5 mm.

NEW ZEALAND: Paihia, 1 ♂, 7 ♀, 17.iii.47, 23–28.ii.50, (*R. A. Cumber*); Paiaka (Man.), 4 ♂, 4 ♀, 1 nymph, 5.i.50, 1, 11.ii.50, 28.ii.59 (*R. A. Cumber*); HE4 RS25 Rd., 1 ♀; HE4 RS 23 P4, 1 ♀; HE4 53 Road, 1 ♀; Mangahao, 1 ♀, 6.i.50 (*R. A. Cumber*); Rotorua, 1 ♂, 1 ♀, 1.ii.27 (*A. Philpott*).

An interesting feature of this sample is that only a small minority of the specimens examined bore spines on the side of the basal post-tarsal segment.

## *NOTOGRYPS* gen. n.

Vertex about as long submedially as broad at base, obtusely rounding into frons, about as wide at apex as at base; frons longer than broad (about 1·5–1·7 : 1), widest near middle, median carina simple, clypeus rather strongly convex, rostrum surpassing post-trochanters; ocelli minute or obsolete; antennae with basal segment about as long as broad, second segment a little more than twice as long as first. Pronotum with disc a little longer in middle line than broad at anterior margin, lateral carinae straight, not attaining hind margin. Post-tibial spur with seven or eight teeth.

Anal segment of ♂ narrowly ring-like, with apical margin produced medially in a blunt lobe. Pygofer with dorsolateral angles produced caudad, diaphragm moderately broad. Aedeagus moderately long, porrect, with a short slender process dorsally at apex.

Type-species, *Notogryps melanthus* sp. n.

In Zimmerman's key (1948 : 139) this species runs to *Nesothoe*, but differs from other species of the genus in the relatively stouter bodily form, the less thickened and elongate post-tibial spur, and the reduced ocelli. From *Nesorthia* it differs entirely in the form of the head and in the structure of the ♂ genitalia.

## *Notogryps melanthus* sp. n.

(Text-figs. 75–85)

Vertex as long submedially as broad at base, obtusely rounding into frons, slightly broader at apex than at base, lateral margins straight, apical margin truncate with submedian carinae prominent, Y-shaped carina distinct, submedian carinae uniting before apex of vertex, basal compartment of vertex wider at hind margin than greatest length (2·3 : 1) and than median length (nearly 3 : 1); frons in middle line longer than wide at widest part (about 1·7 : 1), widest near middle, lateral margins shallowly convex, median carina simple, clypeus at base distinctly wider than frons at apex, postclypeal disc broader at base than long (1·3 : 1), in profile strongly convex, separated by a transverse impression from anteclypeus, which in profile is strongly convex and curved caudad, so that entire clypeus in profile is rather strongly biconvex; rostrum with subapical segment attaining mesotrochanters, apical segment surpassing post-trochanters; antennae short, scarcely attaining fronto-clypeal suture, basal segment as long as broad, second segment longer than first (2·2 : 1). Ocelli very minute or obsolete. Pronotum with disc longer in middle line than broad at anterior margin (1·1 : 1), lateral carinae straight, strongly divergent, not attaining hind margin; post-tibial spur with 8 teeth.

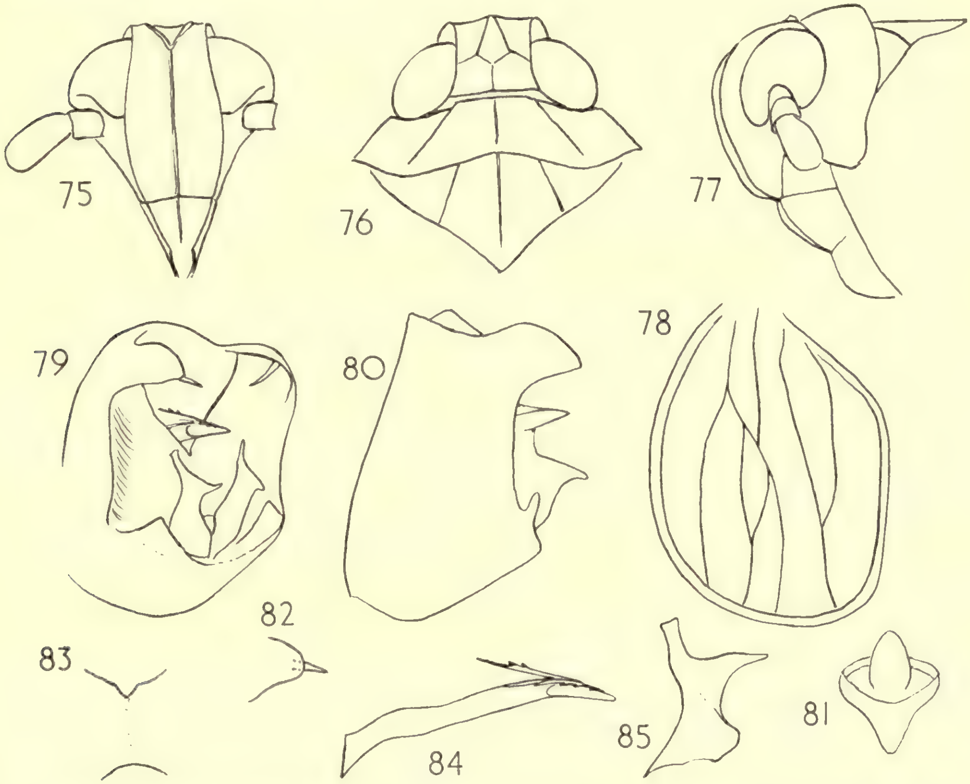
Dark testaceous; vertex, coxae and legs slightly paler; abdominal terga slightly ferruginous. Tegmina brachypterous, brownish hyaline, entire margin pale testaceous, a creamy white spot at middle of apical margin. Male genitalia and pygofer distally, light testaceous.

Anal segment of ♂ very short, ring-like, lateroapical angles not produced, distal margin produced caudad in a broadly triangular lobe extending caudad above base of aedeagus. Pygofer rather large, posterior opening slightly longer than broad, dorsolateral angles very strongly produced, each with a slender subapical spine directed mesad, lateral margins in profile oblique, ventrolaterally produced dorsocaudad on each side in a small triangular lobe ; diaphragm broad with dorsal margin deeply excavate, at middle produced caudad in a weak fold like the lip of a jug ; medioventral process absent. Aedeagus rather long, tubular, porrect caudad, orifice rather long, on left at apex, a narrow sclerotized ridge dorsally above orifice with two teeth, and a moderately long slender process, with two teeth on its margin, arising dorsally subapically, and directed dorsocephalad. Genital styles moderately long, twisted at middle, inner apical angle produced caudad in a short blunt spine, outer apical angle produced cephalad in a lobe apically truncate.

♂ (brachypterous) : length, 2·4 mm., tegmen, 1·4 mm. ♀ (brachypterous) : length, 2·7 mm., tegmen, 1·5 mm.

Holotype ♂, New Zealand : Puketoi (Waewaepa), 29.iii.57 (*R. A. Cumber*), in collection of the Entomology Division, D.S.I.R., Nelson.

Paratypes, 3♂, 4 ♀, same data.



Figs. 75–85. *Notogryps melanthus* sp. n. 75, Frons and clypeus ; 76, head and thorax, dorsal view ; 77, head in profile ; 78, tegmen ; 79, ♂ genitalia, postero-lateral view from left ; 80, ♂ genitalia, left side ; 81, anal segment of ♂, posterior view ; 82, process on dorsolateral angle of pygofer, left side ; 83, median portion of diaphragm ; 84, aedeagus ; 85, genital style.

The anal segment and, to some extent, the genital styles are generally similar to those of *Sardia persephone* (Kirk.) from Queensland. The aedeagus and the dorsolateral margin of the pygofer, however, are very different, and the structure of the former is closely similar to that found in species of *Nesothoe*.

## *Notogryps ithoma* sp. n.

(Text-figs. 86–94)

Vertex as long submedially as broad at base, obtusely rounding into frons, as wide at apex as at base, lateral margins shallowly concave, apical margin truncate with submedian carinae distinctly prominent, Y-shaped carina moderately distinct, submedian carinae uniting at base of frons, basal compartment of vertex wider at hind margin than greatest length (2·1 : 1) and than median length (2·2 : 1) ; frons in middle line longer than wide at widest part (nearly 1·5 : 1), widest near middle, lateral margins distinctly convex, median carina forked at extreme base, clypeus at base distinctly wider than frons at apex, postclypeal disc shorter in middle line than broad at base (1 : 1·4) in profile strongly convex, anteclypeus in profile moderately convex, so that entire clypeus in profile is rather strongly convex ; rostrum with subapical segment surpassing mesotrochanters, apical segment surpassing post-trochanters ; antennae little surpassing frontoclypeal suture, basal segment as long as broad, second segment longer than first (2·5 : 1) ; ocelli minute or obsolete, indicated only by a red pigment spot ; pronotum with disc longer in middle line than broad at anterior margin (1·2 : 1), lateral carinae straight or very weakly convex, moderately diverging, not quite attaining hind margin ; post-tibial spur with seven teeth.

Testaceous ; frons apically, lateral carinae of clypeus, apex of vertex and base of frons, femora at apex, tibiae at apex, abdominal sternites at posterior margin, stramineous or ivory-white. Tegmina hyaline with testaceous suffusion, becoming darker in apical third, middle part of apical margin ivory-white.

Anal segment of ♂ short, ring-like, apical margin slightly produced caudad medially in an obtuse lobe. Pygofer moderately long, posterior opening slightly longer dorsoventrally than broad, dorsolateral angles strongly produced caudad, each rather abruptly terminating in an apical spine, lateral margins distinctly concave, ventral margin shallowly trilobate, lateral lobes blunt ; medioventral process as long as lateral lobes, acute ; diaphragm with dorsal margin excavate, rather broad medially. Aedeagus short, porrect caudad, genital styles moderately long, rather narrowed at middle, strongly expanded distally, inner apical angle produced caudad in a narrow acute lobe, outer apical angle produced laterobasad in a longer and more bluntly tapering lobe which is almost weakly bifurcate at tip.

♂ : length, 2·9 mm., tegmen, 1·5 mm. ♀ : length, 2·9 mm., tegmen, 1·3 mm.

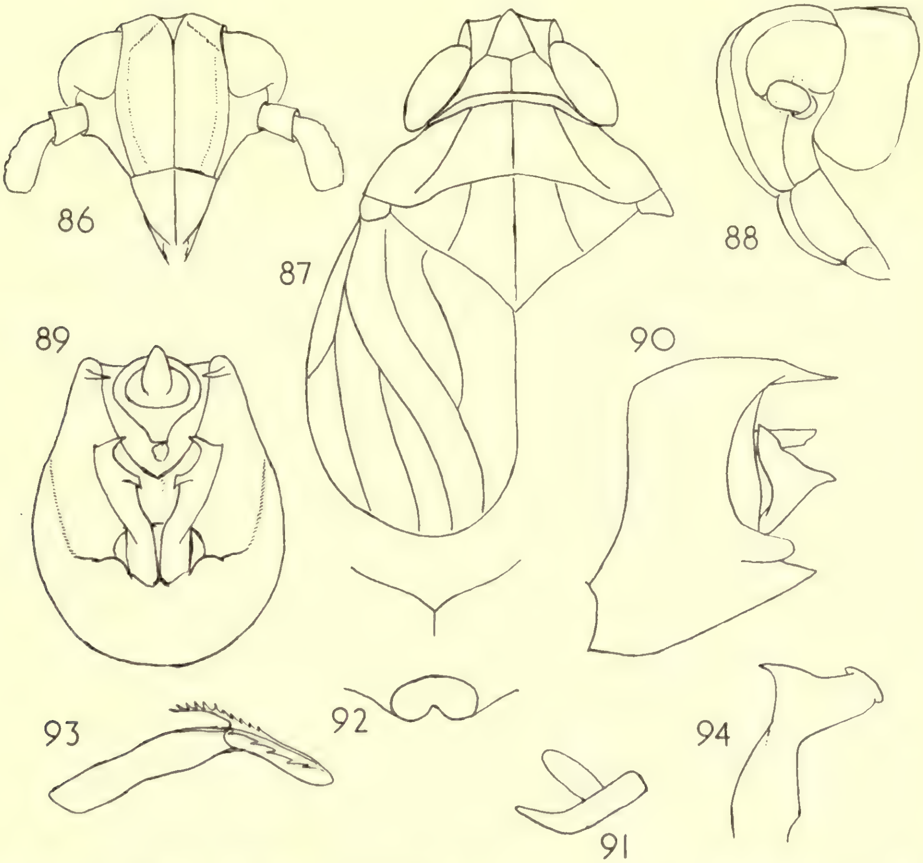
Holotype ♂, NEW ZEALAND : Mangonui, 8.iii.50 (*R. A. Cumber*), in collection of the Entomology Division, D.S.I.R., Nelson.

Paratypes, 2 ♀, 1 nymph, same data.

This species is distinguishable from the preceding by its relatively shorter frons and, in the ♂ genitalia, by the development of spinose processes apically on the dorsolateral angles of the pygofer, not subapically on the inner face. The two species differ appreciably in the form of the genital styles, and to a less extent in details of aedeagal ornamentation.

## *EORISSA* gen. n.

Stoutly built. Vertex about as long submedially as broad at base, about as wide at apex as at base, lateral margins straight or nearly so, apical margin transverse, with submedian carinae



FIGS. 86–94. *Notogryps ithoma* sp. n. 86, Frons and clypeus ; 87, head, thorax and left tegmen ; 88, head in profile ; 89, ♂ genitalia, posterior view ; 90, ♂ genitalia, right side ; 91, anal segment of ♂, right side ; 92, median portion of diaphragm ; 93, aedeagus, left side ; 94, genital style.

not prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (about 2 : 1) ; frons in middle line longer than wide at widest part (about 1·3 : 1), widest at middle, lateral margins strongly convex, each incurved basally to meet in middle line, median carina simple, clypeus at base distinctly wider than frons at apex, postclypeal disc shorter than broad at base, distinctly convex, anteclypeus in profile angulately curved caudad ; rostrum attaining mesotrochanters, apical segment about as long as subapical, antennae slightly surpassing frontoclypeal suture, basal segment longer than broad, second segment longer than first (about 2 : 1), ocelli small. Pronotum with disc about as long in middle line as broad at anterior margin, lateral carinae weakly concave, not attaining hind margin. Total length of mesonotum not as long as that of vertex and pronotum together, posterolateral margins deeply concave. Legs relatively short and stout. Post-tibial spur short, stout, with about 11 minute teeth. Tegmina broadly rounded distally.

Type-species, *Eorissa cicatrifrons* sp. n.

### *Eorissa cicatrifrons* sp. n.

(Text-figs. 95–104)

Vertex as long submedially as broad at base, a little obtusely rounding into frons, as wide at apex as at base, lateral margins almost straight, apical margin transverse-convex, with submedian carinae not at all prominent, Y-shaped carina prominent, submedian carinae uniting at apex of vertex, two obscure transverse carinae in each lateroapical compartment, basal compartment of vertex wider at hind margin than greatest length (2 : 1), and than median length (2·3 : 1); frons in middle line longer than wide at widest part (about 1·3 : 1), widest at middle, lateral margins strongly convex, each uniting basally with a thick arcuate transverse carina which separates vertex from frons, median carina simple to base, disc with about fourteen pustules; clypeus at base distinctly wider than frons at apex, postclypeal disc shorter than broad at base (nearly 1 : 1·2), in profile depressed below level of frons, rather angulately convex, anteclypeus in profile angulately convex, so that entire clypeus in profile is doubly convex; rostrum reaching to mesotrochanters, apical segment about as long as subapical, antennae slightly surpassing frontoclypeal suture, basal segment scarcely longer than broad, second segment longer than first (2 : 1). Ocelli indicated only by a small dark depression, pronotum with disc as long in middle line as broad at anterior margin, lateral carinae concave, not attaining hind margin; sometimes a weak carina transversely across middle of disc; mesonotum very short in both macropterous and brachypterous forms, in former, tegulae with a fine but distinct carina. Post-tibial spur very short and thick with 10–12 small but well separated teeth. Tegmina with $Sc + R$ forked at middle, $Cu_1$ fork basad of $Sc + R$ fork, $M\text{-}Cu$ cross-vein long.

Light yellowish brown; pustules on frons, median carina of clypeus, and three spots laterally on each abdominal tergum, pallid ochraceous or stramineous; a few short stripes on abdominal terga, fuscous. Tegmina (brachypterous) light brownish hyaline, veins concolorous.

Anal segment of ♂ moderately large, ring-like, lateroapical angles each produced ventrad in an acute process. Pygofer rather long, posterior opening longer dorsoventrally than broad, lateral margins produced mesocaudad at middle in a stout subspinose process, diaphragm broad, with dorsal margin rather shallowly concave, armature in form of a rather small subtriangular eminence; medioventral process indicated by a broad shallow median thickening on the lower margin. Genital styles moderately long, rather broad, flattened, with flat surfaces facing caudad, each style gradually expanding distad, curved caudad near apex, apical margin truncate.

Seventh (pregenital) sternite of ♀ scelerotized in form of a trapezoidal plate, with broader end distad, distal margin thickened and apparently submembranous. First valvifers of ovipositor each with inner margin produced mesad at base in a subtriangular lobe, acute at its apex.

♂ (brachypterous): length, 3·3 mm. ♀: length, 3·6–3·8 mm.; tegmen, 4·0 mm.

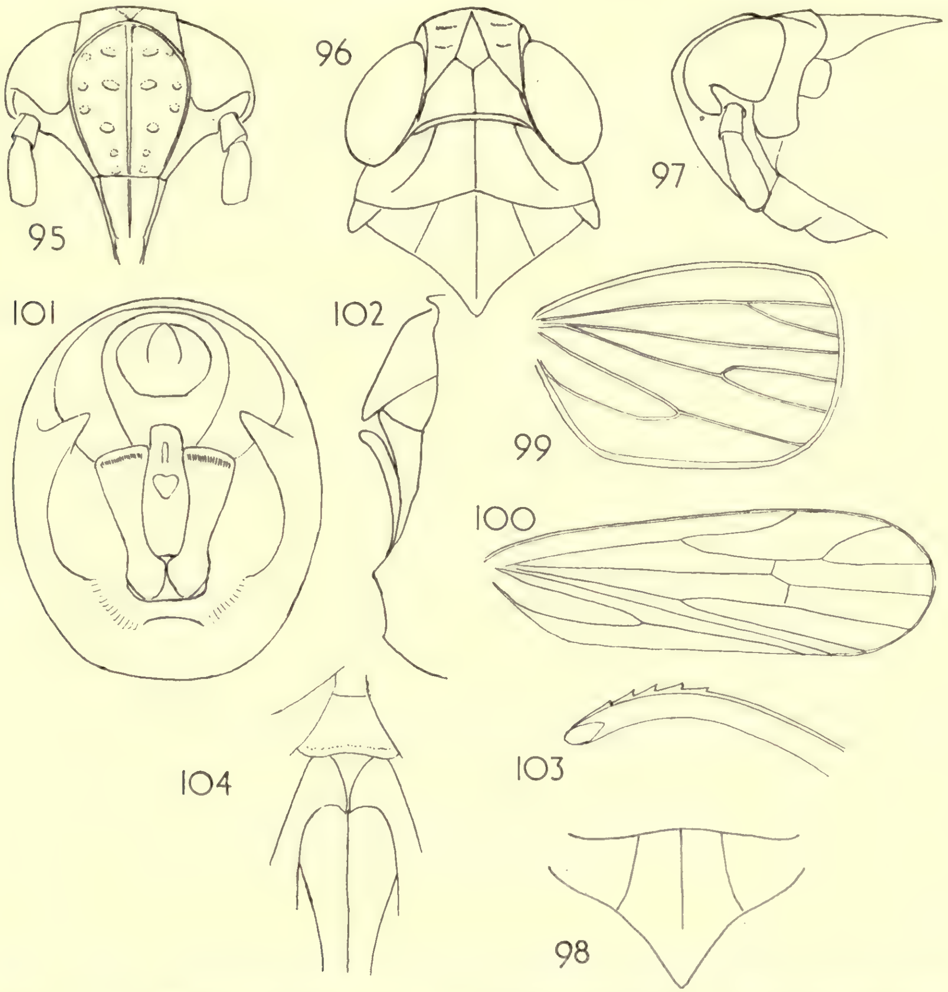
Holotype ♂, NEW ZEALAND: Levin, 22.iv.50 (*R. A. Cumber*), in collection of the Entomology Division, D.S.I.R., Nelson.

Paratypes, 1 ♀, same data; Pukebi, F., 1 ♀, 5.iii.50 (*R. A. Cumber*); Paiaka, Manawatu, 1 ♀, 29.i.51 (*T. E. Woodward*), 1 ♀, 4.i.50 (*R. A. Cumber*).

This remarkable species has all the appearance of an alohine. The condition of the post-tibial spur is indeterminate; it is short, very thick, with the lower surface flattened and slightly recessed below the margins, the teeth, ten to twelve, are short and small, but well separated. For the present it is best placed in the Alohini, in which it comes nearest to *Nesodryas*. The tegminal shape and venation, however, are very appreciably different from those found in *Nesodryas*.

## ***HAPLODELPHAX*** Kirkaldy

Kirkaldy, 1907d : 145.
Orthotype, *Haplodelphax iuncicola* Kirkaldy.



FIGS. 95–104. *Eorissa cicatrifrons* sp. n. 95, Frons and clypeus ; 96, head and thorax of brachypterous form, dorsal view ; 97, head in profile ; 98, mesonotum of macropterous form, dorsal view ; 99, tegmen (brachypterous) ; 100, tegmen (macropterous); 101, ♂ genitalia, posterior view ; 102, ♂ genitalia, right side ; 103, aedeagus, right side ; 104, base of ovipositor, ventral view, with pregenital sclerite in upper third of illustration.

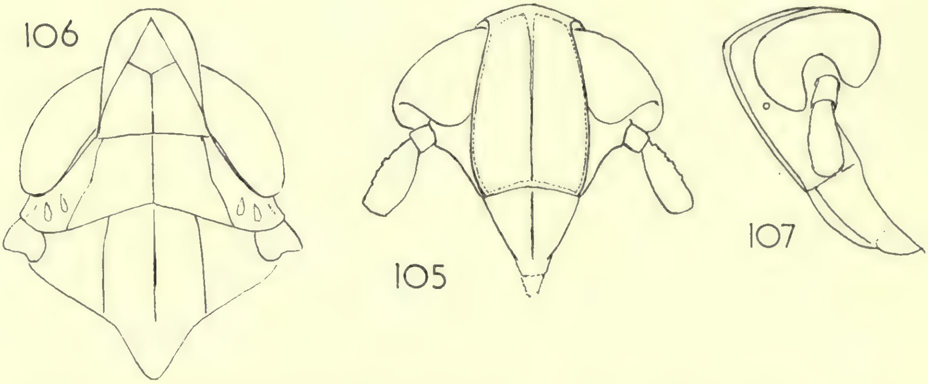
### ***Haplodelphax iuncicola*** Kirkaldy

(Text-figs. 105–107)

Kirkaldy, 1907d : 146.

Australia : New South Wales, Wee Jaspar, 4 ♀, 7.i.55, on grasses and sedges (*T. E. Woodward*) ; S. E. Victoria, Bonang, 1 ♀, 9.1.55 (*T. E. Woodward*) ; Victoria, Lancefield, 1 ♀, 14.i.55 (*T. E. Woodward*) ; Lockyer, 1 ♀, 24.viii.39, on lucerne (*Dept. of Agric.*) ; Brisbane, 1 ♀, 9.xii.55 (*W. F. Wildin*).

Kirkaldy separated the species *naias* from *iuncicola* in the brachypterous form by means of the pattern of markings on the abdominal terga. In the above series from Wee Jaspar, the range of markings includes patterns described as characteristic of each species. A specimen of this series was kindly compared with the type by Dr. J. W. Beardsley, and he reported that it appeared to be nearest to *H. iuncicola.*



Figs. 105–107. *Haplodelphax iuncicola* Kirkaldy. 105, Frons and clypeus ; 106, head and thorax, dorsal view ; 107, head in profile.

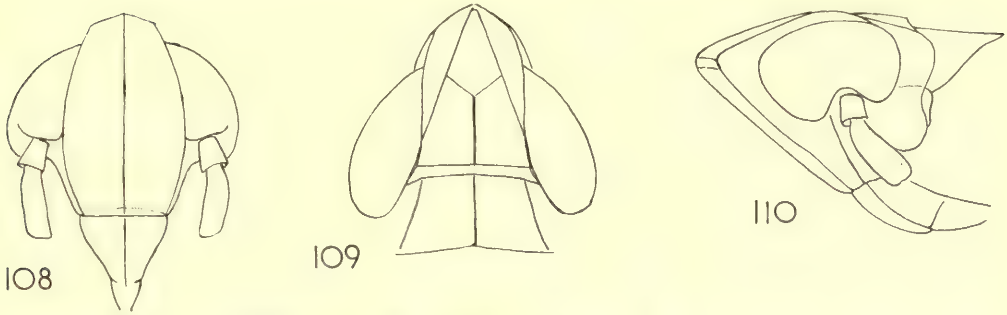
### ***Haplodelphax euronotianus*** Kirkaldy

(Text-figs. 108–110)

Kirkaldy, 1907d : 146.

Australia : Sydney, 1 topotypic ♂, 85.119 (*C. Darwin*) [collected during voyage of the "Beagle". Presented to B.M.(N.H.) by G. Waterhouse in 1855.]

The type-specimen of this species is not in the collection of the H.S.P.A., and cannot at present be traced. Kirkaldy separated *H. euronotianus* from the two other original species of the genus, *iuncicola* and *naias*, by its relatively longer vertex, which is described as being one half longer than wide between the eyes.



FIGS. 108–110. *Haplodelphax euronotianus* Kirkaldy. 108, Frons and clypeus; 109, vertex and pronotal disc; 110, head in profile.

## ***Haplodelphax darwini*** **sp. n.**

(Text-figs. 111–119)

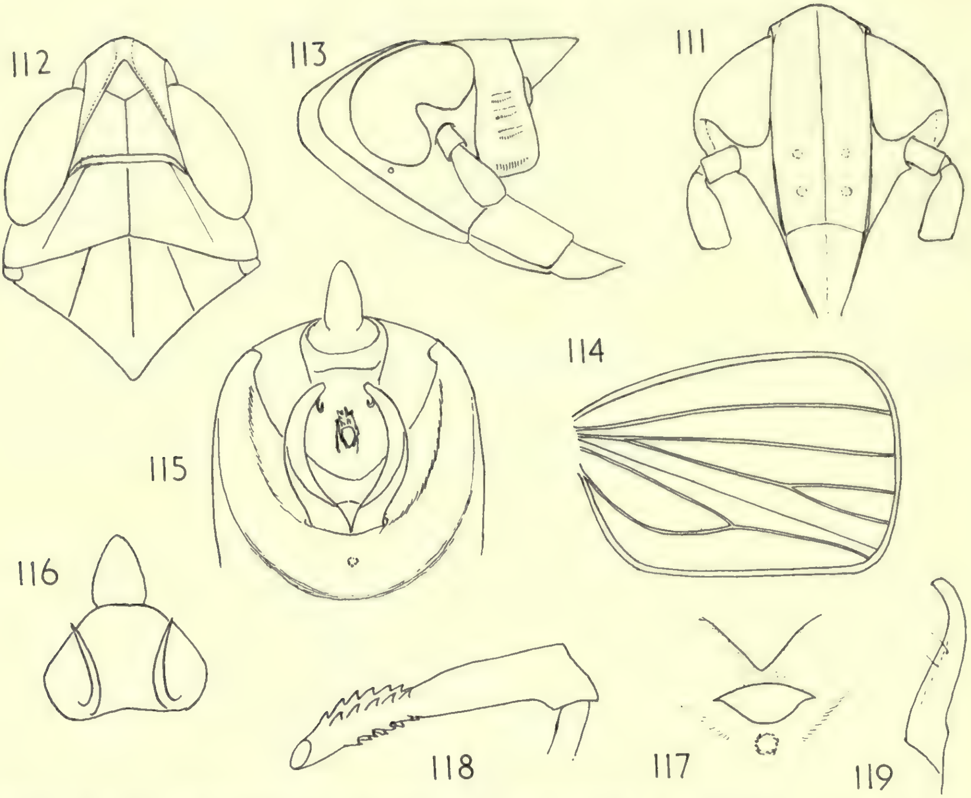
Vertex longer medially than broad at base (about 1·1 : 1), strongly rounding into frons, distinctly narrower at apex than at base, lateral margins straight, weakly diverging basad, apical margin strongly convex with submedian carinae not prominent, Y-shaped carina distinct, submedian carinae uniting before apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·5 : 1), and than median length (1·8 : 1); frons in middle line longer than wide at widest part (2·8 : 1), widest at middle, lateral margins very shallowly convex, almost parallel, median carina simple; clypeus at base very slightly wider than frons at apex, post-clypeal disc as long as broad at base, in profile weakly convex, anteclypeus in profile rather strongly curved caudad; entire clypeus in profile moderately convex; rostrum reaching to level of mesotrochanters; antennae scarcely surpassing level of frontoclypeal suture, basal segment longer than broad (1·2 : 1), second segment longer than first (2 : 1); ocelli small. Pronotum with disc slightly shorter in middle line than broad at anterior margin (1 : 1·1), lateral carinae straight, not attaining hind margin. Post-tibial spur with about 13 teeth.

Anal segment of ♂ short, broader than long, lateroapical angles widely separated, a pair of stout spinose processes arising laterobasally on ventral surface, curving caudad then dorsad. Pygofer moderately long, posterior opening a little longer than broad, dorsolateral angles feebly produced and slightly inflected; diaphragm with dorsal margin deeply concave, subrectangulately excavate at middle, where it is slightly thickened and contiguous with its ventral margin; medioventral process present in form of a small coarsely granulate knob. Aedeagus moderately long, tubular, slightly laterally compressed and decurved in distal half, two rows of coarse teeth, about six in each, dorsally in distal half, and two rows each of about five teeth ventrally in distal half, orifice terminal. Genital styles simple, moderately long, narrow, subcylindrical, weakly sinuate in lateral view, arcuate in posterior view, incurved distally, and bluntly rounded at apex.

♂: length, 2·2 mm.

Holotype ♂ (brachypterous), AUSTRALIA: King George's Sound, 85.119. (*C. Darwin*) [collected during voyage of the "Beagle"], in B.M. (N.H.).

This species differs from *H. euronotianus* in its relatively shorter vertex, and from *naias* in its relatively longer vertex. From *iuncicola* it differs in the subparallel lateral margins of the frons (these being distinctly arcuate in *H. iuncicola*) and in the union of the submedian carinae being more remote from the apex of the head.



Figs. 111–119. *Haplodelphax darwini* sp. n. 111, Frons and clypeus ; 112, head and thorax, dorsal view ; 113, head in profile ; 114, tegmen ; 115, ♂ genitalia, posterior view ; 116, anal segment of ♂, ventral view ; 117, median portion of diaphragm ; 118, aedeagus, left side ; 119, genital style.

## *ANCHODELPHAX* gen. n.

Vertex as long as broad, or a little longer, subrectangularly or obtusely rounding into frons, as wide at apex as at base, lateral margins straight, apical margin transverse-convex with submedian carinae a little prominent, Y-shaped carinae distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·7 or 1·8 : 1) ; frons in middle line longer than wide at widest part (1·8–2·0 : 1), median carina simple, clypeus at base a little wider than frons at apex ; post-clypeal disc shorter in middle line than broad at base ; rostrum long, attaining or surpassing post-trochanters, antennae with basal segment longer than broad (1·4 : 1), second segment longer than first (about 1·7 : 1), third segment rather elongate, cylindrical at base of flagellum ; ocelli small. Pronotum with disc longer in middle line than broad at anterior margin (about 1·3 : 1), lateral carinae not attaining hind margin ; legs rather short and stout, post-tibial spur shallowly tectiform with 12–15 small teeth.

Type-species, *Anchodelphax olenus* sp. n.

In general structure, members of this genus resemble those of *Toya* or *Syndelphax*, but may readily be distinguished by the distinctly long rostrum.

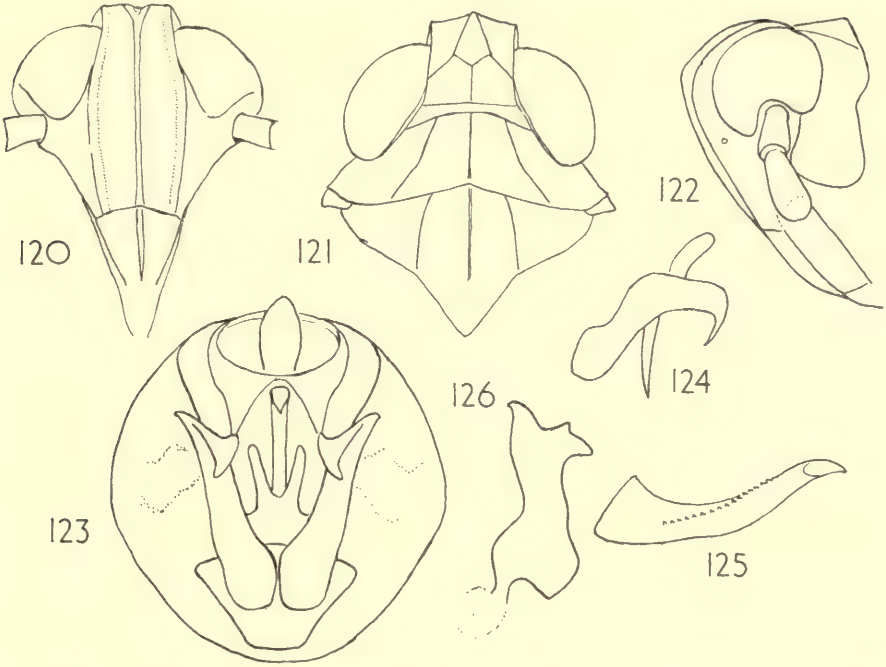
## *Anchodelphax olenus* sp. n.

(Text-figs. 120–126)

Vertex as long submedially as broad at base, obtusely rounding into frons, as wide at apex as at base, lateral margins straight, apical margin truncate or slightly convex with submedian carinae slightly prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·7 : 1) and than median length (2:1) ; frons in middle line longer than wide at widest part (about 2 : 1), widest at middle, lateral margins shallowly convex ; median carina simple or forked only at extreme base ; clypeus at base a little wider than frons at apex, postclypeal disc shorter in middle line than broad at base (1 : 1·2), in profile almost straight, anteclypeus separated by a transverse impression from postclypeus, in profile rather strongly convex, so that entire clypeus in profile is rather strongly convex ; rostrum with subapical segment surpassing mesotrochanters, apical segment attaining post trochanters ; antennae reaching little beyond frontoclypeal suture, basal segment longer than broad (1·4 : 1), second segment longer than first (1·7 : 1). Ocelli present, rather small. Pronotum with disc longer in middle line than broad at anterior margin (1·4 : 1), lateral carinae concave, not very strongly diverging, not attaining hind margin ; post-tibial spur with 13–15 teeth.

Dark castaneous : carinae of frons and clypeus, vertex, pronotum and mesonotum, antennae, rostrum, legs and abdominal sternites of ♀ in part, and ovipositor, testaceous.

Anal segment of ♂ short, ring-like, lateroapical angles moderately close to one another, each produced ventrolaterad in a stout flattened spinose process, at base of segment on each side ventrally a long thin spine directed ventrad. Pygofer moderately long, posterior opening as



FIGS. 120–126. *Anchodelphax olenus* sp. n. 120, Frons and clypeus ; 121, head and thorax, dorsal view ; 122, head in profile ; 123, ♂ genitalia, posterior view ; 124, anal segment of ♂, left side ; 125, aedeagus ; 126, genital style.

broad as long, dorsal margin broadly excavate, dorsolateral angles moderately produced, obtuse in side view, diaphragm narrow with dorsal margin V-shaped and produced medially dorsad in a long bifurcate lobe; medioventral process absent. Aedeagus rather long, tubular, with a ridge along ventral margin, orifice subterminal, directed ventrad, apex slightly decurved. Genital styles moderately long, inner margin at base moderately produced caudad, thence margins sinuately parallel, outer apical angle acute, inner apical angle reflected in an obtusely angulate flange.

First valvifers of ovipositor not produced mesad at base. Pregenital sternite not forming a sclerotised lobe.

♂ (brachypterous): length, 2·0 mm. ♀ (brachypterous): length 3·6 mm.

Holotype ♂, NEW ZEALAND: Manawatu, Paiaka, 5.i.50 (*R. A. Cumber*), in collection of Entomology Division, D.S.I.R., Nelson.

Paratypes, 3 ♂, 1 nymph, same data, 18 ♂, 9♀, 1 mutilated specimen, 5.i.50, on *Muehlenbeckia australis* (*T. E. Woodward*); Auckland, Western Springs, 1 ♂, 22.iv.51 (*T. E. Woodward*); Wellington, Ngahuaranga Gorge, 1 ♂, 1 ♀, 1.ii.51 (*T. E. Woodward*); Levin (south of), Otaki R., 10 ♂, 4 ♀, 21 nymphs, 1 mutilated specimen, sweeping *Convolvulus* and *Muehlenbeckia* (*T. E. Woodward*); HE4 5 Road, RS 37 Paddock, 1 ♂, 1 ♀; Three Kings Group, S.W. Id., 2 ♂, 1 ♀, 13.i.50, on *Lepidium oleraceum* (*T. E. Woodward*).

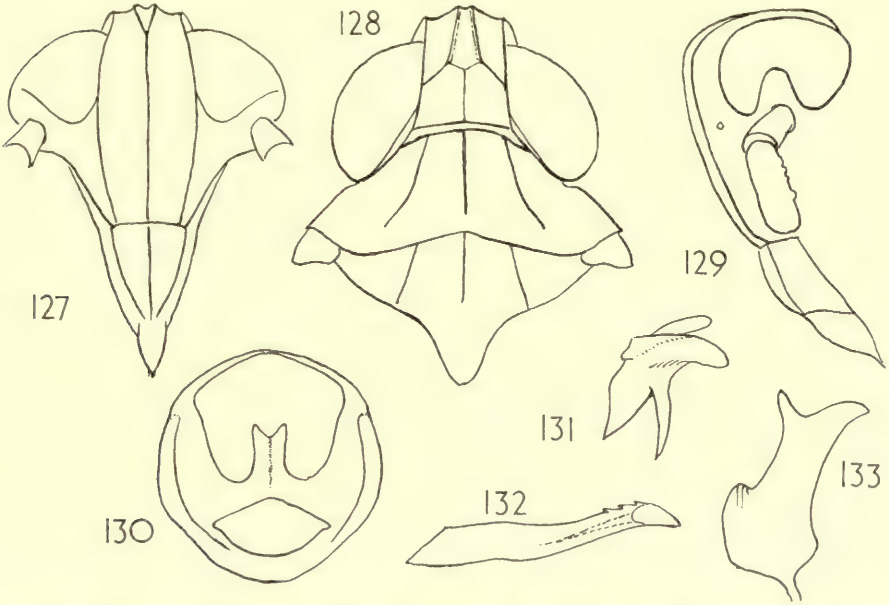
## *Anchodelphax hagnon* sp. n.

(Text-figs. 127–133)

Vertex slightly longer submedially than broad at base (1·1 : 1), subrectangularly rounding into frons, as wide at apex as at base, lateral margins straight, apical margin transverse, with submedian carinae distinctly prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex or at extreme base of frons, basal compartment of vertex wider at hind margin than greatest length (about 1·8 : 1) and than median length (2 : 1); frons in middle line longer than wide at widest part (1·8 : 1), widest at two-thirds from base, lateral margins shallowly convex, median carina simple; clypeus at base a little wider than frons at apex, postclypeal disc shorter in middle line than broad at base (1 : 1·1), in profile slightly convex, anteclypeus in profile strongly curved caudad, so that entire clypeus in profile is moderately convex. Rostrum with subapical segment attaining post-coxae, apical segment almost surpassing post-trochanters; antennae reaching little beyond level of frontoclypeal suture, basal segment longer than broad (1·4 : 1), second segment longer than first (1·6 : 1). Ocelli small. Pronotum with disc longer in middle line than broad at anterior margin (about 1·3 : 1), lateral carinae straight, not attaining hind margin. Post-tibial spur thin, with twelve teeth.

Testaceous; carinae of head and thorax, margins of thoracic segments and abdominal segments and legs, dorsal mid-line of abdomen, anal segment and posterior margin of pygofer, stramineous. Apical segment of tarsi, genital styles and diaphragm of male and third valvulae of ovipositor at apex, fuscous. Tegmina (brachypterous) translucent, margins and veins stramineous.

Anal segment of ♂ rather short, lateroapical angles each produced ventrocaudad in a shallow lobe, a pair of stout, moderately long spinose processes at middle of ventral surface. Pygofer moderately long, posterior opening as broad as long, dorsolateral angles not produced, lateral margin in side view shallowly convex. Diaphragm narrow with dorsal margin very strongly produced dorsad medially in a V-shaped trough; medioventral process absent. Aedeagus moderately long, tubular, slightly sinuate, with about three small teeth on dorsal margin near apex; orifice laterally at apex, apparently on left. Genital styles moderately long, in posterior



FIGS. 127–133. *Anchodelphax hagnon* sp. n. 127, Frons and clypeus; 128, head and thorax, dorsal view; 129, head in profile; 130, pygofer, posterior view; 131, anal segment of ♂, left side; 132, aedeagus, left side; 133, genital style.

view rather narrow, parallel sided, and shallowly bifurcate at apex; in lateral view slightly produced caudad basally, as shown in figure.

♀. No plate developed medially on pregenital sternite; ovipositor with third valvulae distinctly longitudinally impressed near base.

♂ (brachypterous): length, 2·0 mm. ♀ (brachypterous): length, 2·2 mm.

Holotype ♂, NEW ZEALAND: Wellington, Titahi Bay, 1.xi.51, on *Pimelia* (*T. E. Woodward*), in Dominion Museum, Wellington.

Paratypes, 6 ♂, 10 ♀, 1 mutilated specimen, same data, in Queensland Museum, and in collection of the Entomology Division, D.S.I.R., Nelson.

The structure of the anal segment of the ♂ resembles that of *Delphax geranor* Kirk., but the two species differ in the armature of the diaphragm.

## *TAROPHAGUS* Zimmerman

Zimmerman, 1948: 245.
Orthotype, *Megamelus proserpina* Kirkaldy, 1907d: 147.

### *Tarophagus proserpina australis* subsp. n.

(Text-figs. 134–137)

Vertex as long medially as broad at base, subrectangularly rounding into frons, distinctly narrower at apex than at base, lateral margins straight, apical margin shallowly convex, with submedian carinae only weakly prominent, Y-shaped carina weak, submedian carinae not uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·7 : 1), and than median length (2 : 1) ; frons in middle line longer than wide at widest part (2·1 : 1), widest at apex, lateral margins shallowly sinuately diverging, median carina forked at one quarter from base, clypeus at base not wider than frons at apex, postclypeal disc as long as broad at base, in profile very shallowly convex, almost straight, anteclypeus in profile weakly convex ; entire clypeus in profile moderately convex ; rostrum just attaining post-trochanters ; antennae reaching almost to level of apex of post-clypeus, basal segment longer than broad (2·1 : 1), second segment longer than first (1·4 : 1) ; ocelli small. Pronotum with disc shorter in middle line than broad at anterior margin (1 : 1·2), lateral carinae straight, scarcely attaining hind margin. Total length of mesonotum greater than that of scutellum (2·2 : 1). Post-tibial spur with about 36 teeth. Tegmina much surpassing abdomen, deeply rounded apically : $Sc + R$ fork and $Cu_1$ fork at same level, slightly distad of middle, both much distad of union of claval veins.

Castaneous ; a broad band from vertex to apex of scutellum, creamy-white ; rostrum, mesopleurites marginally, post-coxae, tibiae apically, and second post-tarsal segment, stramineous. Tegmina castaneous, apical cells of *R* mostly colourless, commissural margin of clavus white. Wings dilute fuscous, with fuscous veins.

Anal segment of male short, collar-like, lateroapical angles contiguous, each produced ventrad in a stout, tapering spinose process. Pygofer rather long, posterior opening about as long as broad, dorsolateral angles shortly produced, weakly inflected, diaphragm with dorsal margin excavate ; lateral margins below middle each strongly produced caudad in a stout process, tapering distad to an obliquely truncate apex ; medioventral process knob-like, on a stout stalk. Aedeagus only moderately long, laterally compressed, decurved in distal half, a short flagellum arising dorsally at apex, reflected cephalad above aedeagus for half its length, moderately expanding distad, bifurcate apically in two equal acuminate processes. Genital styles strongly divergent, each rather short, broad basally, tapering rapidly to narrow truncate apex, of which outer angle is acutely produced laterad.

♂ : length, 2·8 mm., tegmen, 3·0 mm. ♀ : length, 3·2 mm., tegmen, 3·5 mm.

Holotype ♂ of subspecies, AUSTRALIA : Queensland, Gordonvale, 16.ii.36 (*R. W. Mungomery*) at light, in B.M. (N.H.).

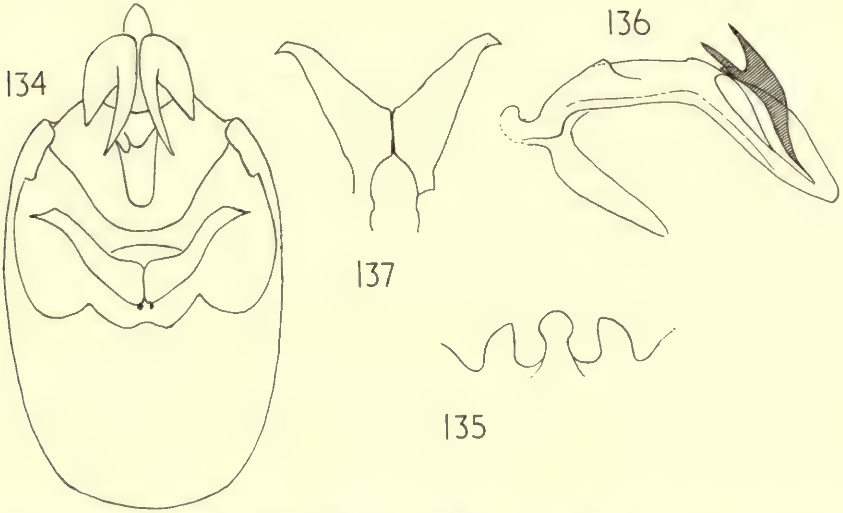
Paratypes, 2 ♀, same data, 16, 19.ii.36.

This subspecies is distinguished from the typical subspecies from Fiji by the form of the vertex and of the ♂ genitalia. In the typical subspecies the ventrolateral processes of the pygofer are large and broad, with the distal margin convex, and the outer distal angle acute, whereas in *T. proserpina australis* they are not large and each tapers rapidly to a short oblique apical margin.

The writer has not seen any two examples of this genus that differ in the trilobate margin of the pygofer and occur side by side in the same area. The form of the lobes appears to be characteristic of the population in each locality, and on present evidence it would appear that *T. proserpina* is a polytypic species.

## *ACRODELPHAX* gen. n.

Vertex declivous, longer submedially than broad at base (about 1·4 : 1), Y-shaped carina feeble, submedian carinae uniting at apex of vertex, basal compartment of vertex wider than greatest length (about 1·3 : 1) ; frons longer than broad (about 1·7 : 1), lateral margins distinctly arcuate, median carina simple, rather thick ; clypeus at base not wider than frons at apex, postclypeal disc as broad at base as long in middle ; rostrum long, attaining post-trochanters ;



FIGS. 134–137. *Tarophagus proserpina australis* ssp. n. 134, ♂ genitalia, posterior view; 135, process on ventral margin of pygofer, ventral view; 136, aedeagus, left side; 137, genital styles.

antennae reaching about to level of middle of clypeus, basal segment longer than broad (about 1·5 : 1), second segment longer than first (nearly 1·7 : 1), ocelli minute; pronotum with disc longer in middle line than broad at anterior margin (about 1·4 : 1), all carinae of disc prominent, lateral carinae straight, not strongly diverging, almost attaining hind margin; mesonotum with disc smooth, almost polished, all carinae prominent and discal area between them shallowly concave; protibiae as long as profemora, post-tibiae with apical teeth stout, rather short, not deeply cleft or strongly splayed out; post-tibial spur with about 13 teeth.

Anal segment of ♂ short. Pygofer moderately short with posterior opening a little longer than broad; no medioventral process present.

Type-species, *Acrodelphax thimbron* sp. n.

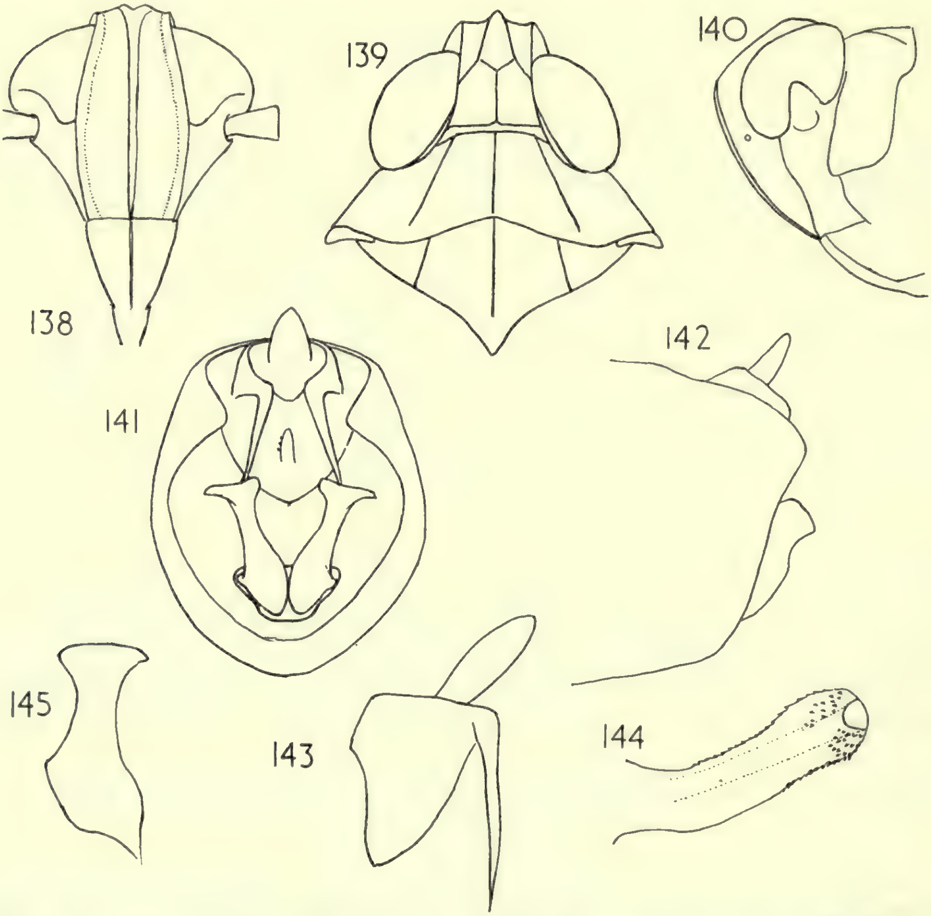
This genus occupies a rather isolated position. Its members are most easily recognisable by the coarse and prominent carination of the frons, vertex, pronotum and mesonotum, the relatively long rostrum, by the relative length of the pronotum and the smooth, rather polished, intercarinal areas of the mesonotum, and by the moderate number of teeth on the post-tibial spur.

### ***Acrodelphax thimbron*** **sp. n.**

(Text-figs. 138–145)

Vertex longer submedially than broad at base (nearly 1·4 : 1), subrectangularly rounding into frons, very slightly narrower at apex than at base, lateral margins almost straight, apical margin truncate with submedian carinae prominent, Y-shaped carina feeble, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·3 : 1) and than median length (about 1·4 : 1); frons in middle line longer than wide at widest part (1·7 : 1), widest near middle, lateral margins distinctly arcuate, median carinae simple, coarse ; clypeus at base not wider than frons at apex, post-clypeal disc as broad at base as long in middle line, in profile moderately convex, its median carina not as prominent as that of frons ; anteclypeus in profile rather strongly curved caudad, so that entire clypeus in profile is rather strongly convex, rostrum with subapical segment surpassing mesotrochanters, apical segment reaching post-trochanters ; antennae reaching to level of middle of clypeus, basal segment longer than broad (1·5 : 1), second segment longer than first (nearly 1·7 : 1), ocelli minute ; pronotum with disc longer in middle line than broad at anterior margin (1·4 : 1), lateral carinae straight, not strongly diverging, almost attaining hind margin ; post-tibial spur with 13 teeth.

Stramineous ; intercarinal areas of frons, anterior compartment of genae, mesonotum poteriorly, pleurites and coxae, abdominal terga laterally and sternites except at margins, pygofer laterally and on diaphragm, fuscous. Tegmina yellowish hyaline, costa and clavus at base, and a suffusion in apical third and anal angle beyond apex of clavus, castaneous.



FIGS. 138–145. *Acrodelphax thimbron* sp. n. 138, Frons and clypeus ; 139, head and thorax, dorsal view ; 140, head in profile ; 141, ♂ genitalia, posterior view ; 142, ♂ genitalia, left side ; 143, anal segment of ♂, left side ; 144, aedeagus, left side ; 145, genital style.

Anal segment of ♂ short, ring-like, lateroapical angles distinctly separated, margin between them membranous, each produced ventrad in a long slender spinose process which appears as if annulate. Pygofer moderately long, posterior opening longer than broad, dorsolateral angles distinctly produced, inflected mesad, rectangulate; diaphragm strongly impressed, dorsal margin rectangulately excavate, medially with a vertical ridge, lateral margins oblique, no medioventral process present. Aedeagus short, laterally compressed, moderately expanding distad, bluntly rounded apically with two tracts of teeth subapically on left side, one tract in dorsal half, with three rows of teeth, the other in ventral half, with four rows of teeth; orifice apical. Genital styles rather long, narrow, sinuately tapering to near apex, abruptly expanded with inner and outer apical angles subacutely and about equally produced mesad and laterad, respectively.

♂: length (brachypterous) 2·4 mm.

Holotype ♂, AUSTRALIA: New South Wales, Barrington Tops, 22.xii.54 (*T. E. Woodward*), in Queensland Museum, Brisbane.

## *IZELLA* gen. n.

Vertex moderately declivous, longer submedially than broad at base (about 1·3 : 1), rather shallowly rounding into frons, about as wide apically as at base, apical margin truncate, Y-shaped carina feeble, submedian carinae uniting at apex of vertex or at extreme base of frons, basal compartment of vertex wider at hind margin than greatest length (about 1·4 : 1); frons longer than broad (nearly 2 : 1), lateral margins shallowly arcuate, median carina simple or forked at extreme base; clypeus at base slightly wider than frons at apex, post-clypeal disc longer in middle line than broad at base (about 1·2 : 1); antennae reaching almost to level of apex of post-clypeus, basal segment longer than broad (about 1·5 : 1), second segment longer than first (about 1·5 : 1); ocelli obsolete; pronotum with disc longer in middle line than broad at anterior margin (about 1·1 : 1), lateral carinae concave, not attaining hind margin; mesonotum shallowly convex, surface minutely granulate, carinae of disc fine, not at all prominent; protibiae as long as profemora; post-tibiae with apical teeth moderately short, not strongly splayed out; post-tibial spur with about 22 teeth.

Anal segment of ♂ short. Pygofer moderately long, posterior opening slightly longer than broad; no medioventral process present.

Type-species, *Izella triopas* sp. n.

This genus may possibly prove to be most readily recognizable by the strong characters of the genitalia in both sexes. These apart, its members may be recognized by the combined characters of a narrow flat frons, a long rostrum, a relatively long pronotum with carinae nearly reaching the hind margin, and a convex granulate mesonotum with very fine carinae. The general build is comparatively stout.

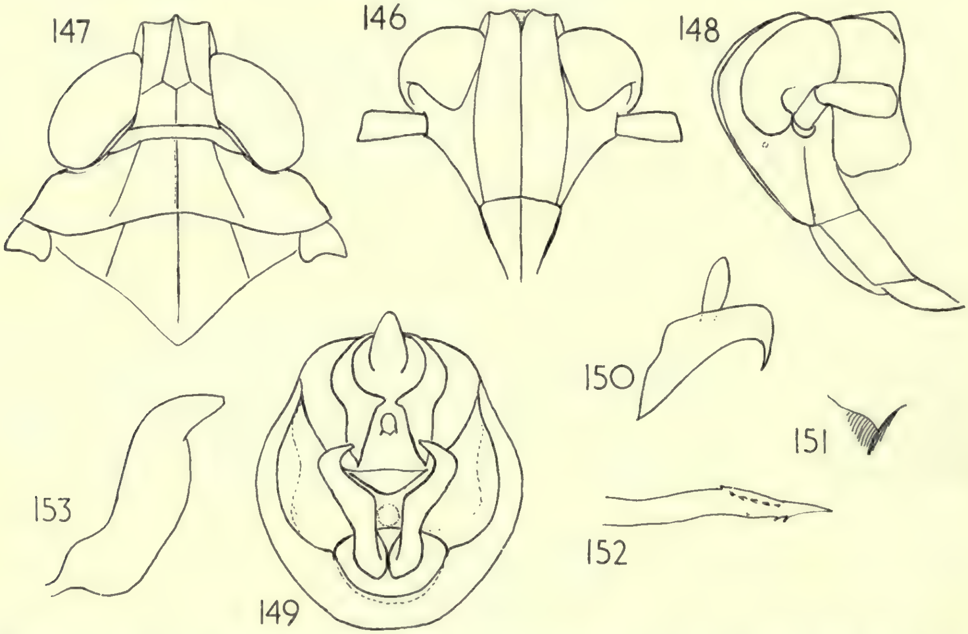
### *Izella triopas* sp. n.

(Text-figs. 146–153)

Vertex longer submedially than broad at base (1·3 : 1) obtusely rounding into frons, as wide at apex as at base, lateral margins straight, apical margin truncate with submedian carinae a little prominent, Y-shaped carina feeble, submedian carinae uniting at apex of vertex or at extreme base of frons, basal compartment of vertex wider at hind margin than greatest length (1·4 : 1) and than median length (1·6 : 1), frons in middle line longer than wide at widest part (1·9 : 1), widest near middle, lateral margins shallowly arcuate, median carina prominent, rather coarse, forked at extreme base, clypeus at base very slightly wider than frons at apex, its median carina as strongly developed as that of frons, postclypeal disc longer than broad at base (nearly 1·2 : 1), in profile rather strongly convex, anteclypeus in profile moderately curved caudad so that entire clypeus in profile is rather strongly convex; rostrum long, surpassing meso-trochanters, and nearly attaining post-trochanters; antennae reaching almost to level of apex of post-clypeus, basal segment longer than broad (1·5 : 1), second segment longer than first (nearly 1·5 : 1). Ocelli obsolete, represented only by a scar. Pronotum with disc longer in middle line than broad at anterior margin (about 1·1 : 1), lateral carinae strongly concave, not attaining hind margin. Post-tibial spur with 22 teeth.

Fuscous-piceous; carinae of frons and clypeus, posterior half of pronotum, posterior margin of ninth tergum, dorsal margin and lateral margins of pygofer, and anal style, stramineous to creamy white; antennae and legs testaceous, post-tibiae and mesotibiae distally paler; first valvifers of ovipositor rather broadly ochraceous on mesal border. Metafemora fuscous. Tegmina (brachypterous) castaneous-piceous, posterior margin broadly creamy-white.

Anal segment of ♂ short, ring-like, lateroapical angles each produced ventrad in a broad rather short spinose process. Pygofer moderately long, posterior opening slightly longer than broad, dorsolateral angles not or only feebly produced, lateral margins strongly sinuate; diaphragm with dorsal margin moderately broad, distinctly produced caudad at middle in a knob-like process flattened on its upper surface; medioventral process absent. Aedeagus moderately long, porrect caudad, serrate on both margins, orifice ventrally at apex. Genital styles moderately long, sinuate, inner margins parallel in basal half, strongly concave distally, exterior margin strongly convex distally, apical angle acute, directed mesad.



Figs. 146–153. *Izella triopas* sp. n. 146, Frons and clypeus; 147, head and thorax, dorsal view; 148, head in profile; 149, ♂ genitalia, posterior view; 150, anal segment of ♂, left side; 151, median part of upper margin of diaphragm, posterolateral view from left; 152, aedeagus, left side, 153, genital style.

Pregenital sternite of ♀ a little produced caudad at middle in a shallowly convex lobe, deflexed at margin. First valvifers of ovipositor each strongly produced mesad in an acutely angulate lobe, of which the apical portion is shallowly reflected.

♂ (brachypterous): length, 2·1 mm. ♀ (brachypterous): length, 3·2 mm.

Holotype ♂, NEW GUINEA: Central Highlands, Daulo Pass, *c.* 8,000 ft., 20–22.viii. 56 (*T. E. Woodward*), in Queensland Museum, Brisbane.

Paratypes, same data, 3 ♀.

## *THRASYMEMNON* gen. n.

Vertex longer medially than broad at base (about 1·3 : 1), subrectangularly rounding into frons, slightly narrower at apex than at base, lateral margins straight or shallowly concave, apical margin transverse with submedian carinae moderately prominent, Y-shaped carina present, submedian carinae not uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length; frons in middle line longer than wide at widest part (approximately 2·5 : 1), widest near middle, lateral margins shallowly arcuate, median carina forked in basal half; postclypeal disc rather longer than broad at base, in profile weakly convex; rostrum surpassing mesotrochanters, almost attaining post-trochanters; antennae slightly surpassing frontoclypeal suture, basal segment twice as long as broad, second segment longer than first (about 1·7 : 1); ocelli prominent. Pronotum with disc slightly longer in middle line than broad at anterior margin, lateral carinae straight or weakly convex, almost attaining hind margin. Post-tibial spur with about 16 teeth, including one at apex.

Anal segment of ♂ short, lateroapical angles indistinct, not produced in a process. Pygofer moderately long, posterior opening distinctly longer dorsoventrally than broad, ventral margin produced caudad in a process medially; diaphragm broad.

Type-species, *Delphax kaha* Kirkaldy.

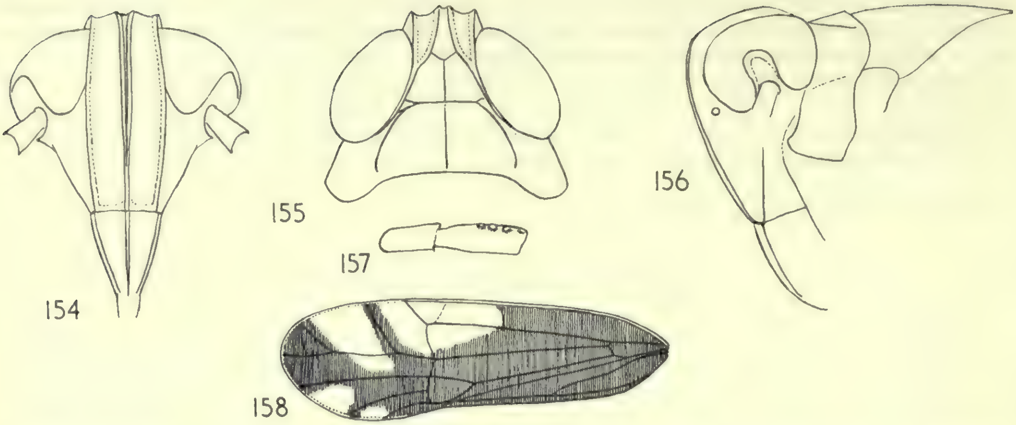
### ***Thrasymemnon kaha*** (Kirkaldy) **comb. n.**

(Text-figs. 154–158)

*Delphax kaha* Kirkaldy, 1907: 158.

AUSTRALIA: Queensland, Tambourine Mts., 1 ♂, 18–25.v.35 (*R. E. Turner*) B.M. 1935–240.

Muir (1917d: 328) placed this species in *Megamelus*, a delphacine genus defined at that time largely by the proportions of the vertex and the direction of the lateral discal carinal of the pronotum. The ♂ genitalic structure of *D. kaha*, however, is entirely different from that of *Megamelus notula* Germar (type-species of *Megamelus*) and its allies, and the ocelli are well developed, not feeble. In superficial appearance *D. kaha* resembles a *Sardia* or *Sogatodes*, but the rostrum is distinctly longer than in either, and the structure of the vertex differs markedly from that of the former. From *Matutinus* the present genus is readily distinguishable by the form of the spur, which has teeth in a single row with a separated and well developed apical tooth: the latter is obsolete or weak in *Matutinus* and the teeth are usually arranged in two staggered rows.



FIGS. 154–158. *Thrasymemnon kaha* (Kirkaldy). 154, Frons and clypeus ; 155, vertex and pronotum ; 156, head in profile ; 157, antenna ; 158, tegmen.

## *SARDIA* Melichar

Melichar, 1903b : 96.
Haplotype, *Sardia rostrata* Melichar, 1903b : 96.

### ***Sardia rostrata pluto*** (Kirkaldy) **stat. n.**

*Hadeodelphax pluto* Kirkaldy, 1906c : 313.

AUSTRALIA : S.E. Queensland, Bell Bunya Rd., 2 ♂, 4 ♀, 11.viii.55 (*T. E. Woodward*) ; Brisbane, 1 ♀, 10.iii.46 (*R. Simmons*) ; 1 ♂, 3.xi.57 (*P. C. Kerridge*) ; 1 ♂, 4.iv.56 (*W. Jones*), 1 ♀, 4.iii.55. (*B. R. Grant*) ; 1 ♂, 1 ♀, 31.iii.56 (*Kirkpatrick*), 1 ♂, 9.iv.56. (*T. E. Woodward*) ; Cleveland, 1 ♀, 10.iii.57 (*N. Yarrow*) ; Queensland, 5 miles from Kingarry, 1 ♂, 5.vi.59 (*E. Exley*) ; Northern Territory, Glen Ormiston, 1 nymph, 18.viii.59 (*E. M. Exley*) ; Queensland, Lamington Nat. Pk., 1 ♀, 27.v.59 (*F. R. Perkins*) ; Lawes, 2 ♂, 6.xii.56, 8.i.57 (*W. F. Wildin*) ; Nosman, 1 ♂, 12.xi.58 (*I. Resaeva*) B.M. 1960–203.

The writer has examined material of both sexes of *rostrata* from Ceylon (the type locality of this species), of *pluto* from Queensland, and of populations from India, Pakistan, Saigon, Cocos Id., New Britain, and Sunday Id., and cannot find any clear-cut line of division to suggest the existence of two species. The most obvious difference between the population in Ceylon and that in Queensland is the length of the vertex, but a range of intermediate stages has been found in areas more or less intervening.

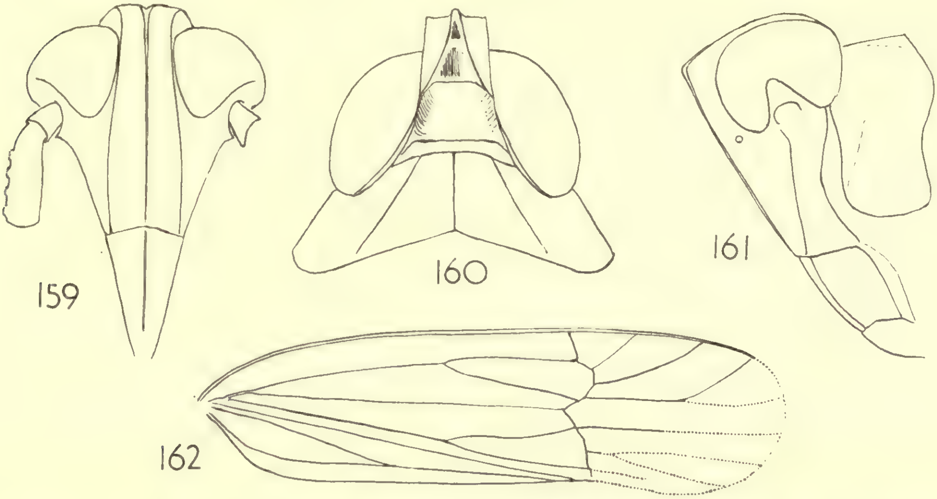
### ***Sardia persephone*** (Kirkaldy)

(Text-figs. 159–162)

*Liburnia fumipennis* Melichar, 1903b : 97 (preoccupied by *Liburnia fumipennis* Fieber, 1872a : 6), **syn. n.**

*Hadeodelphax persephone* Kirkaldy, 1907d : 141.
*Sardia pronotalis* Distant, 1916a : 141, **syn. n.**

AUSTRALIA : Lawes, 1 ♀, iii.53 (*R. M. Beames*).



FIGS. 159–162. *Sardia persephone* (Kirkaldy). 159, Frons and clypeus ; 160, vertex and pronotum ; 161, head in profile ; 162, tegmen (apical portion incomplete).

## *SOGATODES* Fennah

Fennah, 1963 : 71.
Orthotype, *Sogatodes molinus* Fennah, *op. cit.* : 72.

### *Sogatodes nicias* sp. n.

(Text-figs. 163–170)

Vertex longer submedially than broad at base (1·4 : 1), subacutely rounding into frons, almost as wide at apex as at base, lateral margins straight, apical margin truncate with submedian carinae slightly prominent, Y-shaped carina feeble, only its anterior arms distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (about 1·4 : 1) and than median length (1·7 : 1) ; frons in middle line longer than wide at widest part (2·4 : 1), widest in distal half, lateral margins constricted between eyes, then parallel to frontoclypeal suture, median carina simple, clypeus at base little, if at all, wider than frons at apex, postclypeal disc as long as broad at base, in profile very shallowly convex, almost straight, anteclypeus in profile moderately convex, so that entire clypeus in profile is rather shallowly convex ; antennae attaining frontoclypeal suture, basal segment longer than broad (1·8 : 1), second segment longer than first (1·6 : 1). Pronotum with disc longer in middle line than broad at anterior margin (1·4 : 1) lateral carinae straight, not attaining hind margin. Total length of mesonotum longer than that of mesoscutellum (about 2·7 : 1). Post-tibial spur with 25–26 teeth.

Fuscous ; carinae of frons and clypeus, vertex, most of disc and lateral lobes of pronotum, disc of mesonotum and mesoscutellum and posterior margin of pygofer dorsally, creamy-white ;

disc of clypeus between carinae, antennae, fore and middle legs, light testaceous ; hind legs stramineous or sordid white. Tegmina hyaline, most of corium and posterior half of membrane suffused fuscous, veins concolorous. Wings milky hyaline with fuscous veins.

Anal segment of ♂ short, ring-like, lateroapical angles each strongly produced ventrocephalad in a short stout spinose process, flattened laterally. Pygofer moderately long, posterior opening ovate, longer dorsoventrally than broad, dorsolateral angles not produced caudad, lateral margins oblique, diaphragm moderately broad, produced caudad in median portion, with dorsal margin elevated at middle ; no medioventral process developed. Aedeagus tubular, sinuately tapering to acuminate apex. Genital styles short, twisted at middle, slightly expanded distally, inner apical angle acute, outer apical angle bluntly rounded.

♂ : length, 2·3 mm., tegmen, 3·1 mm. ♀ : length, 2·4 mm., tegmen, 3·2 mm.

Holotype ♂, New Guinea : W. Highlands, Al Valley, *c.* 6,000 ft., 25.viii.56 (*T. E. Woodward*), in Queensland Museum.

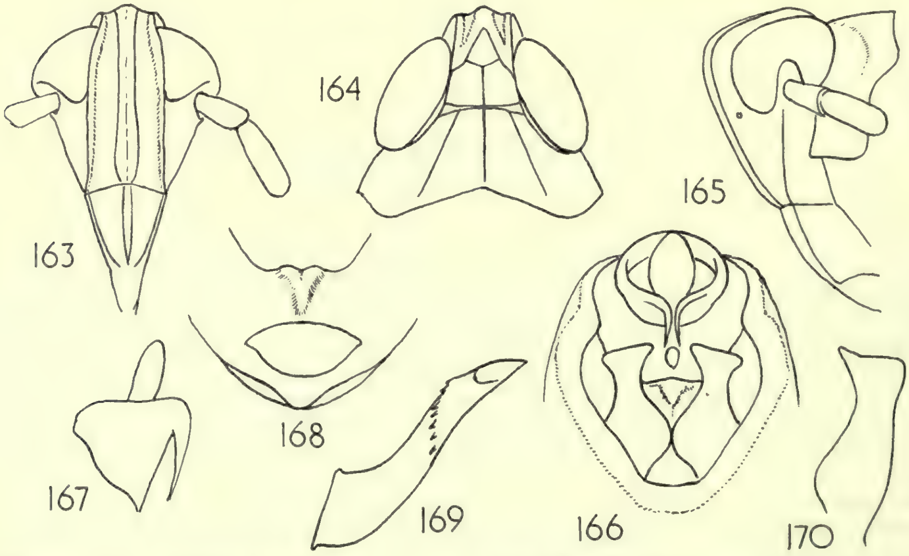
Paratype, 1 ♀, same data.

This species is referred provisionally to *Sogatodes* on account of the shape of the head and the structure of most elements of the ♂ genitalia. It is distinguished from other species of the genus by the shape of the armature of the diaphragm, in which it agrees only with *Sogata anomala* Muir. From this species it is separated by the short genital styles and the pattern of spinose ornamentation on the aedeagus.

### ***Sogatodes eupompe*** (Kirkaldy) **comb. n.**

*Delphax eupompe* Kirkaldy, 1907d : 150.

Australia : Queensland, Babinda, 1 ♂, 11.x.35 (*R. W. Mungomery*).



Figs. 163–170. *Sogatodes nicias* sp. n. 163, Frons and clypeus ; 164, vertex and pronotum ; 165, head in profile ; 166, ♂ genitalia, posterior view ; 167, anal segment of ♂, left side ; 168, diaphragm of pygofer ; 169, aedeagus, left side ; 170, genital style.

## ***CORONACELLA*** Metcalf

Metcalf, 1950 : 59.
Orthotype, *Coronacella kirkaldyi* (Muir), 1917d : 329. (= *C. bella* Metc.)

### ***Coronacella kirkaldyi*** (Muir)

AUSTRALIA : Queensland, Cairns, 2 ♂, viii.1904, B.M. 1942–95.

The two males before the writer show interesting differences that for their interpretation require the study of further material. In one, the frons is relatively longer than in the other, and the clypeus is distinctly carinate medially, and the carina, like the lateral carinae, is creamy white. In the other the clypeus is ecarinate medially, and the disc is infuscate, only the lateral carinae being pale. The ♂ genitalia of the former specimen agree generally with those of the second, but all elements appear to be a little longer.

## ***SOGATELLA*** Fennah

Fennah, 1956 : 471.
Orthotype, *Delphax furcifera* Horváth.

### ***Sogatella kolophon*** (Kirkaldy)

*Delphax kolophon* Kirkaldy, 1907d : 157.

AUSTRALIA : Brisbane, 1 ♂, 24.iii.55 (*D. Greenhill*), 1 ♀, 10.xii.55 (*W. F. Wildin*), 2 ♂, 19.iii.54 (*K. L. S. Harley*), 1 ♂, iv.54 (*R. Domrow*), 1 ♂, 12.x.56 (*J. Martin*) ; S. Queensland, Lamington Nat. Pk., 1 mutilated specimen, 4.v.56 (*I. G. Yeo*) ; Moggil, 2 ♀, 7.v.55, sweeping grass (*T. E. Woodward*) ; Queensland, Mackay (*c.* 100 m. S.), Lotus Creek, 1 ♀, 2.vi.56, on grasses (*I. C. Yeo*) ; Redland Bay, 1 ♂, 20.iii.54 (*G. Hooper*) ; Numinbah, 1 ♀, 20.iv.35 ; Yeerongpilly, 3 ♂, 6.xi.39, from lucerne (*W. A. Smith*) ; Running Ck., 1 ♂, 7 ♀, 15.iv.41 (*A. W. Smith*) ; Ashton Pk., near Nosman, 1 ♂, 16.xii.59 (*N. Nickitin*) B.M. 1960–203.

### ***Sogatella furcifera*** (Horváth)

*Delphax furcifera* Horváth, 1899a : 372.

AUSTRALIA : Northern Territory, Humpty Doo, 2 ♂, 1 ♀, 12.iv.62 (*S. I. Li*).

### ***Sogatella longifurcifera*** (Esaki & Ishihara)

*Delphacodes longifurcifera* Esaki and Ishihara, 1947 : 41.

AUSTRALIA : Lockyer, 1 ♂ (damaged), 24.vii.39, on lucerne (*Dept. of Agric.*).

This ♂ is tentatively assigned to this species. Its coloration is more intense and the medioventral process of the pygofer more distinct than in specimens of this species from Formosa.

## ***SYNDELPHAX*** Fennah

Fennah, 1963 : 15.
Orthotype, *Delphax matanitu* Kirkaldy.

### ***Syndelphax matanitu*** (Kirkaldy)

*Delphax matanitu* Kirkaldy, 1907d : 155.

AUSTRALIA : Queensland, Ayr, 1 ♂, 1.xii.54 (*G. Saunders*).

## ***CORBULO*** **gen. n.**

Vertex as long medially as broad at base, or a little longer than broad, obtusely angulately rounding into frons, about as wide at apex as at base, apical margin truncate with submedian carinae weakly prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex or at extreme base of frons, basal compartment of vertex wider at hind margin than greatest length (about 1·5 : 1) ; frons in middle line longer than wide at widest part (about 2·2 : 1), widest near middle, lateral margins convex, median carina simple ; clypeus at base scarcely wider than frons at apex, postclypeal disc as long as broad at base, rostrum not quite reaching to post-trochanters ; antennae not or scarcely attaining level of frontoclypeal suture, basal segment about as long as broad, second segment longer than first (about 1·8 : 1) ; ocelli rather small but distinct, blemmata distinct. Pronotum slightly wider than head (with eyes), disc in middle line as long as broad at anterior margin, lateral carinae straight, not attaining hind margin. Post-tibial spur thin, tectiform with about 20 minute teeth.

Anal segment of ♂ moderately short, collar-like, two spinose processes arising apically, directed ventrad. Pygofer moderately short, with posterior opening longer dorsoventrally than broad or as long as broad, diaphragm moderately narrow. Genital styles rather short.

Type-species, *Delphax dilpa* Kirkaldy, 1907d : 162.

This genus is distinguishable by the combination of characters shown in the synopsis. From *Coronacella* it can be distinguished most readily by its distinctly coarser build. This is most evident in the structure of the hind leg, where, in *Corbulo*, the tibia is not greatly longer than the femur, and the spines at its apex are large and splayed-out, whereas the opposite conditions are found in *Coronacella*.

### ***Corbulo dilpa*** (Kirkaldy)

*Delphax dilpa* Kirkaldy, 1907d : 162.

NEW ZEALAND : Auckland, Waitangi Est., 1 ♂, 18–19.xi.51 (*T. E. Woodward*) ; HE 4 3 Paddock, 1 ♂ ; Rotorua, Hannah's Bay, 1 ♂, 1 ♀, 4.ii.51 (*T. E. Woodward*).

AUSTRALIA : Queensland, Lam. Nat. Pk., 1 ♂, 25.v.49 (*F. A. Perkins*) ; Lockhart, R. Mission, 1 ♂, 8.vi.56, sweeping grass and weeds (*E. N. Marks*) ; Eight M. Plns., 1 ♂, 14.iv.58 (*F. R. From*).

### ***Corbulo dodona*** **sp. n.**

(Text-figs. 171–174)

*Kelisia paludum* Kirkaldy ; Muir, 1917 : 310 (*pars*).

Vertex as long medially as broad at base or slightly longer than broad. Subrectangularly-obtusely rounding into frons, slightly narrower at apex than at base, lateral margins straight, apical margin truncate with submedian carinae moderately prominent, Y-shaped carina moderately distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (about 1·5 : 1) ; and than median length (1·8 : 1) ; frons in middle line longer than wide at widest part (2·2 : 1), widest at two thirds from base, lateral margins shallowly convex, median carina simple ; clypeus at base only very little wider than frons at apex, postclypeal disc as long as broad at base, in profile very weakly convex, anteclypeus in profile weakly convex ; entire clypeus in profile shallowly convex ; rostrum surpassing mesotrochanters, but not attaining post-trochanters ; antennae slightly surpassing frontoclypeal suture, basal segment longer than broad (1·6 : 1), second segment longer than first (1·8 : 1) ; ocelli distinct, of moderate size. Pronotum with disc slightly longer in middle line than broad at anterior margin (1·1 : 1), lateral carinae weakly concave, not attaining hind margin. Total length of mesonotum greater than that of scutellum (2·4 : 1). Post-tibial spur with about 19 teeth.

Fuscous ; vertex, disc and hind margin of pronotum, carinae of frons and clypeus, basal segment of rostrum, ventrites at posterolateral angles, and dorsal angles of pygofer, pallid yellow or creamy white ; apical segment of rostrum, antennae and legs testaceous. Tegmina hyaline, with very dilute fuscous suffusion, veins fuscous, a linear spot between common claval vein and commissural margin dark fuscous, the margin pallid just basad of this.

Holotype ♂, AUSTRALIA : Deception Bay, 25.iii.54 (*Y. B. Beri*), in Queensland Museum, Brisbane.

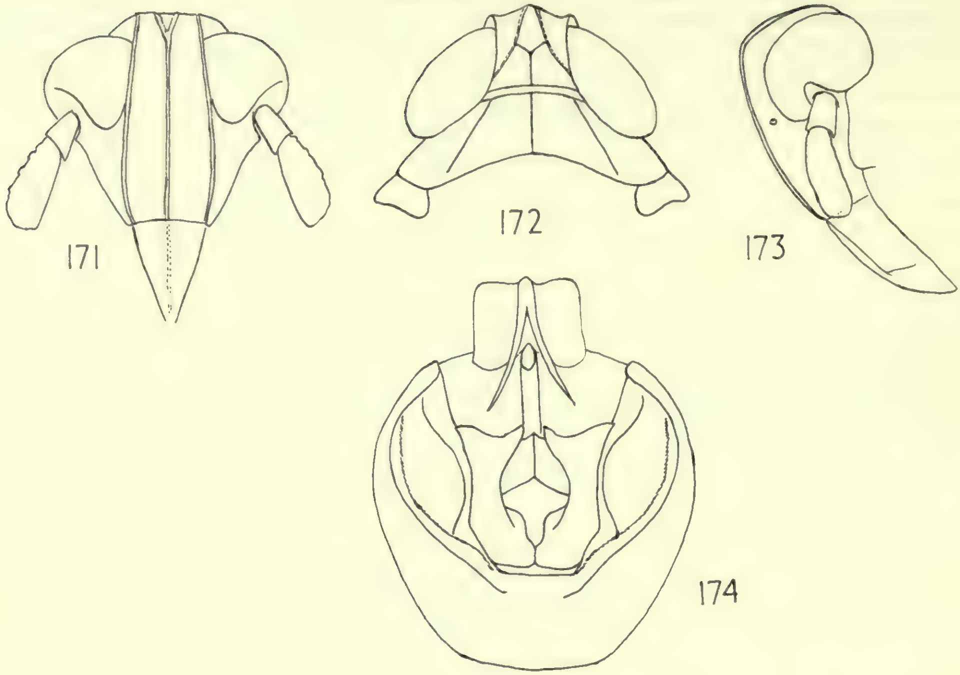
Paratypes, Lamington National Park, 1 ♂, 25.v.59 (*F. A. Perkins*) ; Moggil, 1 ♂, 27.vi.54 (*G. Hooper*) ; Brisbane, 1 ♂, iii.57 (*N. McKenna*).

The ♂ genitalia of this species have been figured by Muir and very closely resemble those of Hawaiian *Kelisia paludum* Kirk., to which Muir (*loc. cit.*) was satisfied that this Australian and eastern Asiatic species should be referred. The two species are separable by the size of the ocelli, the form of the head and the slope of the lateral pronotal carinae. The Fijian form that Muir considered to be annectant between the Hawaiian and Australasian populations is a more heavily built insect with dark coloration and minute ocelli that are not greatly more distinct than the blemmata.

## *SULIX* gen. n.

Species of robust build. Vertex longer submedially than broad at base, if only slightly so, subacutely rounding into frons, as wide at apex as at base, lateral margins straight, rather coarsely carinate, apical margin transverse or slightly convex, with submedian carinae moderately prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (approximately 1·5 : 1) ; frons in middle line longer than wide at widest part (about 2 : 1), widest at level of lower margin of eyes, lateral margins distinctly convex, median carina simple ; clypeus at base slightly or even markedly wider than frons at apex, postclypeal disc about as long as broad at base, in profile convex, anteclypeus in profile evenly curved caudad, so that entire clypeus in profile is moderately convex ; rostrum surpassing mesotrochanters ; antennae a little surpassing frontoclypeal suture, basal segment short, slightly longer than broad, second segment longer than first (about 2 : 1) ; ocelli small or obsolete. Pronotum with disc longer in middle line than broad at anterior margin, lateral carinae anteriorly straight, but curved laterad basally, not attaining hind margin. Post-tibial spur tectiform, with about 18 teeth. Basal metarsal segment apically with seven or eight spines.

Anal segment of ♂ with distal margin narrow at middle, otherwise rather broad. Pregenital sternite of ♀ rather thick, produced ventrocaudad in a short narrowly-rounded finger-like lobe.



Figs. 171–174. *Corbulo dodona* sp. n. 171, Frons and clypeus ; 172, vertex and pronotum, 173, head in profile ; 174, ♂ genitalia, posterior view.

Type-species, *Sulix vetranio* sp. n.

This genus is distinguished by the combination of characters given in the key to genera. Its members are all of moderate size, with a vertex longer than broad, and with coarse carinae, a moderately long rostrum and small ocelli, or none.

### ***Sulix meridianalis*** (Muir) **comb. n.**

*Delphacodes meridianalis* Muir, 1917d : 334.

In this species the ocelli are small but distinct, and in the ♂ genitalia the dorsolateral angles of the pygofer are inflected and acutely pointed ; the diaphragm is narrow in its median portion and is inclined caudad from the ventral to the dorsal margin, and no vertical carina is developed in the middle line.

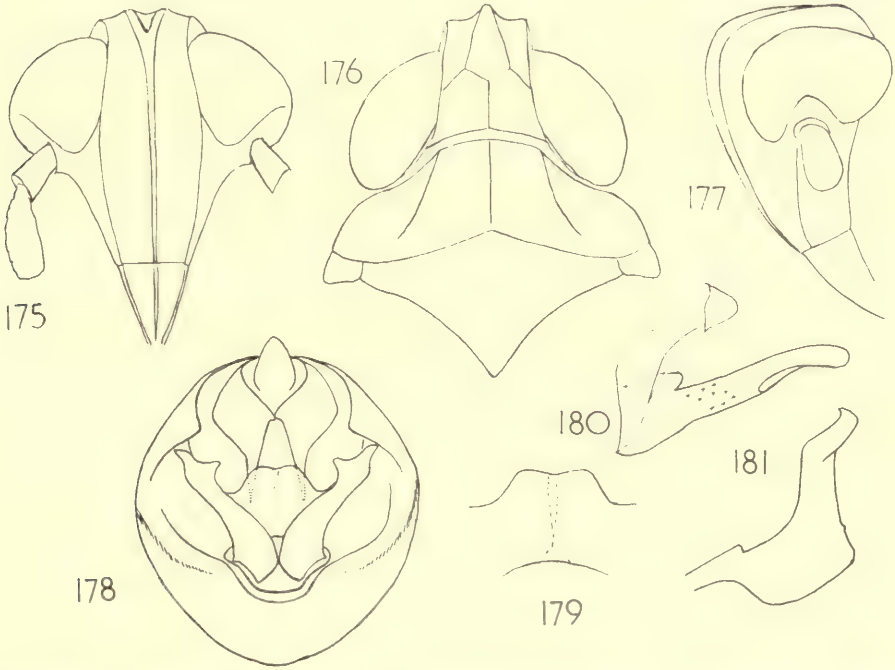
New Zealand : Three Kings Group, Great Id., East Point, cliff slopes, on and under *Poa anceps*, 9 ♂, 11 ♀, 14.1.51 (*T. E. Woodward*), 1 ♂, 2 ♀, 21 (*J. S. Edwards*) ; Great Id., Castaway Stream, 1 ♀, 10.i.51, on sedges (*T. E. Woodward*) ; Great Id., Bald Hill, 1 ♀, 12.i.51, on grasses and rushes (*T. E. Woodward*) ; Great Id., Tasman valley, east side, 1 ♀, 12.i.51, on grasses and sedges (*T. E. Woodward*) ; S.W. Id.

1 ♀, 3.i.51, on grasses (*T. E. Woodward*); Wellington, Titahi Bay, 5 ♂, 5♀, 1.ii.51, on grasses, sedges and rushes (*T. E. Woodward*); Manawatu, Foxton, 1 ♂, 4 ♀, 28.i.51, in sand dunes, on *Scirpus frondosus* (*T. E. Woodward*).

## ***Sulix insecutor* sp. n.**

(Text-figs. 175–181)

Vertex longer submedially than broad at base (1·2 : 1), subacutely rounding into frons, rather narrower at apex than at base, lateral margins feebly sinuate or straight, apical margin truncate with submedian carinae narrowly prominent, Y-shaped carina weak but distinct, submedian carinae uniting at apex of vertex or at extreme base of frons, basal compartment of vertex wider at hind margin than greatest length (1·7 : 1) and than median length (1·8 : 1); frons in middle line longer than wide at widest part (2·3 : 1); widest at about two-fifths from base, lateral margins shallowly arcuate, median carina simple or narrowly forked at extreme base; clypeus at base not wider than frons at apex, postclypeal disc as long as broad at base, in profile straight, anteclypeus in profile moderately convex, separated from postclypeus by a shallow transverse sulcus, so that entire clypeus in profile is shallowly sinuately convex. Rostrum slightly surpassing mesotrochanters. Antennae reaching to frontoclypeal suture, basal segment longer than broad (1·8 : 1), second segment longer than first (1·6 : 1). Ocelli obsolete. Pronotum with disc longer in



FIGS. 175–181. *Sulix insecutor* sp. n. 175, Frons and clypeus; 176, head and thorax, dorsal view; 177, head in profile; 178, ♂ genitalia, posterior view; 179, median portion of diaphragm; 180, aedeagus, left side; 181, genital style.

middle line than broad at anterior margin (1·2 : 1), lateral carinae straight or weakly concave, not attaining hind margin. Post-tibial spur with 17 teeth.

Anal segment of ♂ short, broader than long, lateroapical angles moderately separated, each produced ventrad in a slender spinose process. Pygofer longer ventrally than dorsally, posterior opening as broad as long; dorsolateral angles not produced, broadly rounded and very weakly inflected, diaphragm moderately narrow with dorsal margin strongly convex in its middle portion, and with a fine but distinct vertical carina medially; medioventral process absent. Aedeagus moderately long, tubular, in lateral view with dorsal margin abruptly elevated in basal quarter; about nine very small teeth laterally in the middle; orifice on ventral surface subapically. Genital styles moderately long, rather narrow, sinuately diverging from base and tapering to apical quarter, where each expands and curves slightly mesad; apical margin shallowly concave, with inner and outer angles subacutely produced.

♂ (brachypterous): length, 3·4 mm.

Holotype ♂, NEW ZEALAND: Paiaka (Man.) H.E. 41, 4.i.50 (*R. A. Cumber*), in collection of the Entomology Division, D.S.I.R., Nelson.

Paratype, Paiaka (Man.) H.E. 41, 1 ♂, 4.i.50 (*R. A. Cumber*).

This species is near to *S. meridianalis* Muir, but is distinguishable by the dorsolateral angles of the pygofer not being acute or pointed, by the median portion of the diaphragm being strongly convex dorsally, vertical, and medially carinate, as opposed to weakly convex, obliquely inclined ventrocephalad and medially ecarinate, and by the strongly sinuate and tapering form of the genital styles. The species may be separated by the ocelli, which are obsolete or represented only by a scar in the present species, but present, though small, in *S. meridianalis*.

### ***Sulix tasmani*** (Muir) **comb. n.**

*Delphacodes tasmani* Muir, 1923i: 258.

In this species the intercarinal areas of the frons are usually dark fuscous, and the lateral ocelli distinct. In the ♂ genitalia, the lateroapical spinose processes of the anal segment are widely separated and the dorsolateral angles of the pygofer are not inflected.

NEW ZEALAND: Manawatu, Paiaka, 1 ♂, 4.i.50 (*T. E. Woodward*); HE 7 RS, 7, 10, 31, 46, 57, 58, 6 ♂, 2 ♀, 2 mutilated specimens, nymph; HE7 48 Paddock, 2 ♂, 1 ♀; N. Auckland, near Kaikohe, Punakitere, 3 ♂, 1 ♀, ii.52 (*T. E. Woodward*); Hauraki Gulf, Little Barrier Id., 9 ♂, 13 ♀, 11.xii.50, on grasses and sedges (*T. E. Woodward*); Little Barrier Id., Te Titoki Point, 1 ♀, 25.xi.54, swept at bush margin, (*R. A. Harrison*); Ohakura, 1 ♂, 1923 (*T. R. Harris*); Whangarei, 1 ♂, 12.xi.23 (*J. G. Myers*); Mangonui, Paiaka, HE 41, 6 ♂, 2 ♀, 11–14, 11.49, 4, 30.i.50, 12.ii.50, 16.i.51 (*R. A. Cumber*); Wellington, Ngahuaranga Gorge, 1 ♀, 1.vii.51 (*T. E. Woodward*); Coromandel Pen., Cape Colville, Te Hope, Moehau Track, 1 ♂, 1 ♀, 17.i.52, grass sward; Cape Colville, Otautu area, 2 ♂, 2 ♀, 16.i.52 (*T. E. Woodward*); Manawatu, Foxton, 1 ♂, 6 ♀, 5.i.50 (*T. E. Woodward*); Rotorua, Whaka, 3 ♂, 5.ii.52 (*T. E. Woodward*); W. Spirits Bay 1 ♀, 25.i.50, on small-leaved *Muehlenbeckia* (*T. E. Woodward*).

## ***Sulix vetranio*** **sp. n.**

(Text-figs. 182–187)

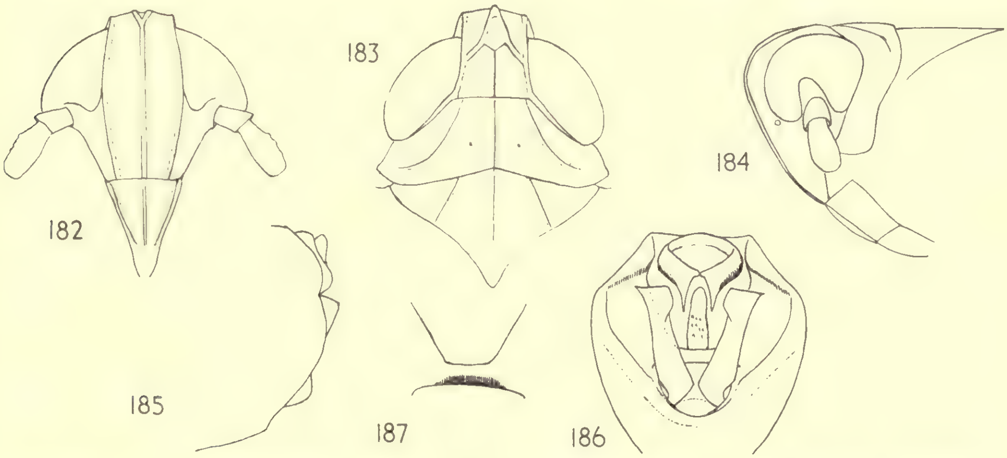
Vertex scarcely longer submedially than broad at base (not quite 1·1 : 1), subacutely rounding into frons, as wide at apex as at base, lateral margins straight, apical margin transverse with submedian carinae moderately prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·5 : 1) and than median length (2 : 1) ; frons in middle line longer than wide at widest part (2 : 1), widest near middle, lateral margins distinctly convex, median carina simple ; clypeus at base markedly wider than frons at apex, postclypeal disc as long as broad at base, in profile convex, anteclypeus in profile evenly curved caudad so that entire clypeus in profile is moderately convex ; rostrum surpassing mesotrochanters but not attaining post-trochanters ; antennae a little surpassing frontoclypeal suture, basal segment short, a little longer than broad, second segment longer than first (about 2 : 1) ; ocelli small. Pronotum with disc longer in middle line than broad at anterior margin (nearly 1·6 : 1), lateral carinae distally straight, weakly curved laterad basally, not attaining hind margin. Post-tibial spur with 18 teeth.

Stramineous ; a slight suffusion on coxae, abdominal terga anteriorly towards lateral margins, and ♂ genitalia except posterior margin of pygofer, castaneous ; distal part of genital styles more yellowish-brown. Tegmina castaneous, entire margin stramineous.

Anal segment of ♂ collar-like, lateroapical angles moderately close together, each produced ventrad in a stout spinose process. Pygofer moderately long, posterior opening broader than long, dorsolateral angles not produced, very weakly developed and inflected, diaphragm with dorsal margin deeply excavate, narrow medially, devoid of ornamentation, medioventral process absent. Genital styles rather long, directed mainly dorsad, approximately of equal width throughout, with inner margin slightly more concave than outer, and weakly produced mesad in a quadrate lobe in distal fifth ; apical margin truncate, outer apical angle acute.

♂ : length, 3·0 mm. ♀ : length, 3·5 mm.

Holotype ♂, NEW ZEALAND : Manawatu, Foxton, 28.i.51, sand dunes, on *Scirpus frondosus* (*T. E. Woodward*), in Dominion Museum, Wellington.



FIGS. 182–187. *Sulix vetranio* sp. n. 182, Frons and clypeus ; 183, head and thorax, dorsal view ; 184, head in profile ; 185, ♂ genitalia, left side ; 186, ♂ genitalia, posterior view ; 187, median portion of diaphragm.

Paratypes, 3 ♂, 4 ♀, same data, in Queensland Museum, Brisbane.

This species is distinguished by the postclypeus being very markedly wider than the apical margin of the frons. The ♂ genitalia are generally similar to those of *S. meridianalis*, but the two species are different in the shape of the head and in coloration.

## *EUMETOPINA* Breddin

Breddin, 1896a : 109.
Haplotype, *Eumetopina kruegeri* Breddin, *loc. cit.*
*Gelastodelphax* Kirkaldy, 1906c : 411, **syn. n.**

### ***Eumetopina histrionica*** (Kirkaldy) **comb. n.**

*Gelastodelphax histrionicus* Kirkaldy, 1906c : 411.

Post-tibial spur with about eleven teeth.

AUSTRALIA : Victoria (S.E.), Bonang, 9.i.55 (*T. E. Woodward*).

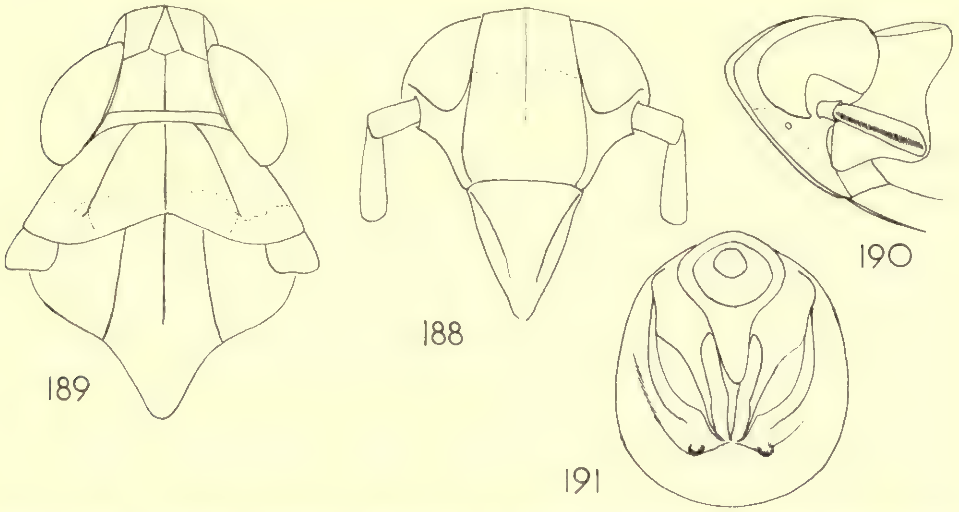
### ***Eumetopina bicornis* sp. n.**

(Text-figs. 188–191)

Vertex as long submedially as broad at base, subacutely rounding into frons, only very slightly narrower at apex than at base, lateral margins distinctly concave, apical margin transverse-convex with submedian carinae not at all prominent, Y-shaped carina with only distal arms distinct, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (1·6 : 1) and than median length (1·8 : 1) ; frons in middle line longer than wide at widest part (1·4 : 1), widest at one-fifth from base, lateral margins shallowly convex, median carina simple ; clypeus at base distinctly wider than frons at apex, a little depressed below level of frons, postclypeal disc as long as broad at base, in profile shallowly convex, anteclypeus in profile almost straight, so that entire clypeus in profile is very shallowly convex ; rostrum attaining mesotrochanters, apical segment about equal to subapical ; antennae moderately surpassing frontoclypeal suture, basal segment longer than broad (2 : 1), second segment longer than first (2·2 : 1), ocelli distinct. Pronotum with disc longer in middle line than broad at anterior margin (nearly 2 : 1), lateral carinae almost straight, not attaining hind margin. Total length of mesonotum longer than that of scutellum (nearly 1·8 : 1). Post-tibial spur with 25–30 minute teeth.

Castaneous-piceous ; distal two-thirds of frons and genae, second antennal segment, except for a longitudinal band, a broad band along hind margin of pronotum, apex of mesoscutellum, and hind legs, pallid stramineous ; clypeus, tegulae, fore and middle legs and abdominal ventrites marginally, pale orange-yellow. Tegmina milky hyaline, apical margin infumed fuscous from apex of tegmen to apex of clavus, veins concolorous. Wings milky hyaline, with pale yellowish brown veins.

Anal segment of ♂ moderately long, rectangulately deflexed in distal half, apical margin strongly produced at middle in an elongate triangular process. Pygofer moderately long, posterior opening a little longer than broad, dorsolateral angles rather weakly produced, obtuse in lateral view, diaphragm developed only at sides, median transverse portion absent ; posterior margin of pygofer ventrally with a stout spinose process, flattened above and porrect caudad, on each side of middle line. Aedeagus narrowly tubular, porrect caudad, a slender spinose process arising on left at apex directed ventrocephalad, a stouter spinose process arising on right at apex,



FIGS. 188–191. *Eumetopina bicornis* sp. n. 188, Frons and clypeus ; 189, head and thorax, dorsal view ; 190, head in profile ; 191, ♂ genitalia, posterior view.

directed to right. Genital styles moderately long and narrow, diverging only little, with dorsal margin straight and ventral margin shallowly convex, apical margin short, oblique. Anal segment, pygofer posteriorly and genital styles distally with rather long and stout setae.

♂ : length, 4·0 mm., tegmen, 4·3 mm.

Holotype ♂, NEW GUINEA : Central Highlands, Daulo Pass, 7,300 ft.–8,000 ft., 20–22.viii.56 (*T. E. Woodward*), in Queensland Museum, Brisbane.

Paratypes, Gomanigu Valley, *c.* 3 miles S.W. of Mt. Otto, *c.* 7,300 ft., 1 ♂, 1 ♀, 16–18.iii.56 (*T. E. Woodward*).

This species is separable in the ♂ from all others of the genus by the presence of a single pair of stout spinose processes ventrally on the hind margin of the pygofer. The male of *Eumetopina histrionica* (Kirk.) possesses similar, but longer, processes, but between them lies a second pair of short stout processes, of which there is no trace in *E. bicornis*. In both sexes the present species is also distinguishable by details of bodily and tegminal coloration.

## *TERTHRON* gen. n.

Vertex as long medially as broad at base, subacutely rounding into frons, as wide at apex as at base, lateral margins straight or feebly concave, apical margin transverse with submedian carinae very feebly prominent, Y-shaped carina weakly present, submedian carinae uniting at apex of vertex, basal compartment of vertex wider at hind margin than greatest length (about 2 : 1) ; frons in middle line longer than wide at widest part (2 : 1), widest at middle, lateral margins shallowly convex, median carina simple, clypeus at base very slightly wider than frons at apex, postclypeal disc as long as broad at base, in profile very feebly convex, almost straight, entire clypeus in profile moderately convex ; rostrum rather short, surpassing mesotrochanters but not attaining post-trochanters ; antennae attaining level of frontoclypeal suture or slightly surpassing it, basal segment distinctly longer than broad, second segment longer than first (about 1·5 : 1); ocelli distinct, blemmata present. Pronotum with disc about as long in middle line as broad at anterior margin, lateral carinae straight, not quite attaining hind margin, not directed towards tegulae, but farther mesad. Post-tibial spur thin, shallowly tectiform with about twenty teeth.

Type-species, *Delphax anemonias* Kirkaldy.

Members of this genus resemble those of *Toya*, but differ in having the following combination of characters; the lateral carinae of the pronotal disc do not extend towards the tegulae and, if they were produced, would reach the hind margin; the first valvulae of the ovipositor are long and narrow and arise from the base of the abdomen, which, in ventral view, is narrowly triangular; the ♂ genitalic pattern is close to that of the type-species. The species so far included possess a narrow white median stripe from the vertex to the apex of the mesoscutellum and a white commissural margin on the tegmina.

In addition to the type-species, *Terthron* includes *Delphacodes albovittata* Mats., (1931a : 1268). The gender of the generic name is neuter.

### ***Terthron anemonias*** (Kirkaldy)

*Delphax anemonias* Kirkaldy, 1907d : 159.

AUSTRALIA: Queensland, Carmila, 1 ♀, 8.v.27, 6729.

In this species a narrow pale stripe extends along the dorsal edge of the femora and the veins in the tegminal membrane are light yellowish brown.

## ***TOYA*** Distant

Distant, 1906i : 472.
Orthotype, *Toya attenuata* Distant.

### ***Toya propinqua*** (Fieber) **comb. n.**

*Delphax propinqua* Fieber, 1866b : 525.

AUSTRALIA: Brisbane, 1 ♂, 9.iv.56 (*T. E. Woodward*).

### ***Toya dryope*** (Kirkaldy) **comb. n.**

*Delphax dryope* Kirkaldy, 1907d : 154.

NEW ZEALAND: N. Auckland, Waitangi Est., 24 ♂, 25 ♀, 7 mutilated specimens, 1 nymph, 18–19.xi.51 (*T. E. Woodward*); 17 ♂, 6 ♀, HE 4, 1, 15, 24, 28 Paddock, 1, 3, 41 Road; Paihia, 7 ♂, 4 ♀, 1 mutilated specimen, ii.53 (*R. A. Cumber*).

AUSTRALIA: Lockyer, 14 ♂, 2 ♀, 24.viii.39 (*Dept. of Agric.*); Brisbane, 1 ♂, 2 ♀, at light (*H. Jarvis*); Bolingbroke, 2 ♂, 22.v.27; five miles from Kingaroy, 1 ♂, 3.vi.59 (*E. Bernays*); Bald Hills, 1 ♂, 24.iii.54 (*K. L. S. Harley*); Yeerongpilly, 2 ♂, 6.xi.39, from lucerne (*W. A. Smith*).

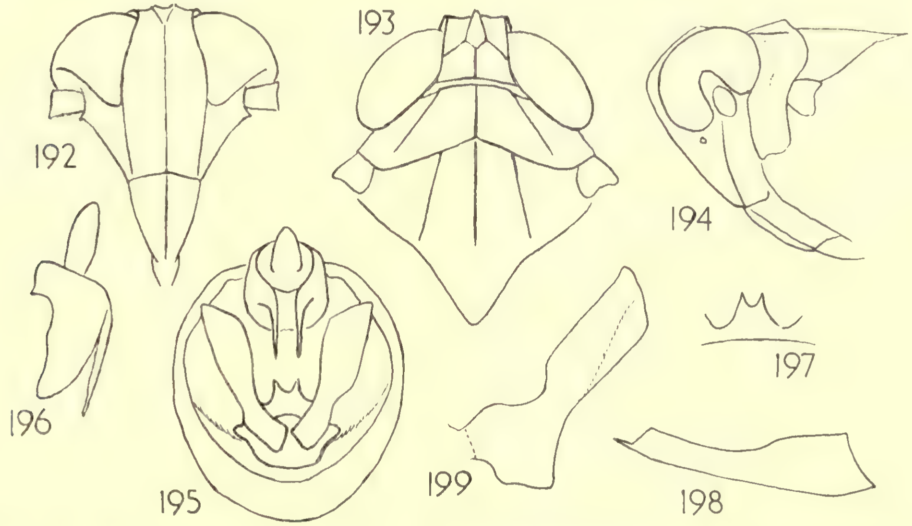
## *Toya euonymus* sp n.

(Text-figs. 192–199)

Vertex shorter submedially than broad at base (about 1 : 1·2), obtusely rounding into frons, slightly narrower at apex than at base, lateral margins straight, apical margin truncate, with submedian carinae very weakly prominent, Y-shaped carina distinct, submedian carinae uniting at apex of vertex or at extreme base of frons, basal compartment of vertex wider at hind margin than greatest length (2 : 1) and than median length (2·5 : 1) ; frons in middle line longer than wide at widest part (2·2 : 1), widest at two-fifths from base, lateral margins very feebly convex, median carina simple, or forked at extreme base ; clypeus at base distinctly wider than frons at apex, postclypeal disc longer than broad at base (nearly 1·2 : 1), in profile moderately convex, anteclypeus in profile very shallowly convex, so that entire clypeus in profile is shallowly convex ; rostrum short, attaining meso-trochanters ; antennae distinctly surpassing frontoclypeal suture, basal segment longer than broad (1·6 : 1), second segment longer than first (2 : 1) ; ocelli distinct. Pronotum with disc shorter in middle line than broad at anterior margin (about 1 : 1·3), lateral carinae weakly concave, not attaining hind margin. Total length of mesonotum longer than that of scutellum (about 2·6 : 1). Post-tibial spur with 19 teeth.

Fuscous ; carinae of head and pronotum, antennae, clypeus, rostrum, tegulae, mesonotum at lateral angles and along posterior margin, and legs, testaceous ; posterior margin of pronotum broadly white. Tegmina hyaline, veins very dilute testaceous, almost concolorous. Wings hyaline with dilute testaceous veins.

Anal segment of ♂ very short, ring-like, lateroapical angles rather closely approximated, each produced ventrad in a long slender spinose process. Pygofer moderately long, posterior opening as broad as long, dorsolateral angles not produced, diaphragm with dorsal margin deeply concave, very narrow at middle, where dorsal margin is produced in a pair of small acutely angulate lobes ; medioventral process absent. Aedeagus moderately long, tubular, slightly



Figs. 192–199. *Toya euonymus* sp. n. 192, Frons and clypeus ; 193, head and thorax, dorsal view ; 194, head in profile ; 195, ♂ genitalia, posterior view ; 196, anal segment of ♂, left side ; 197, median portion of diaphragm ; 198, aedeagus, left side ; 199, genital style.

broader in basal two-fifths than in distal three-fifths, orifice at apex, its lower lip produced caudad in an acuminate lobe ; aedeagus otherwise without ornamentation. Genital styles long, flattened and rather broad, slightly expanding distad, apical margin oblique, inner margin at base a little produced caudad.

♂ : length, 3·0 mm., tegmen, 3·1 mm.

Holotype ♂, AUSTRALIA : South-east Queensland, Tambourine Mts., 11–18.iv.35 (*R. E. Turner*) B.M. 1935—240, in B.M. (N.H.).

Paratype, Miva, 1 ♂, i.51 (*Lipsett*).

This species is distinguished by the proportions of the head, bodily coloration, and the structure of the ♂ genitalia.

### *Toya lazulis* (Kirkaldy) **comb. n.**

*Delphax lazulis* Kirkaldy, 1907d : 155.
*Delphacodes lazulis* (Kirkaldy) Muir, 1917d : 333.

AUSTRALIA : Queensland, five miles from Kingaroy, 1 ♂, 3.vi.59 (*E. Bernays*).

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*Pp.* 61–112 ; 66 *Text-figures*

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# DIPTERA FROM NEPAL

## EMPIDIDAE

By KENNETH G. V. SMITH

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### SYNOPSIS

The Empididae collected on the 1954 and 1961–62 British Museum Expeditions to Nepal are systematically treated. Thirty-eight new species, 1 new subspecies, representing 18 genera are described and their relationships discussed. A lectotype is designated for Hemerodromia xiphias Bezzi.

### INTRODUCTION

THIS paper is based mainly on material collected by Mr. R. L. Coe, entomologist on the 1961–62 British Museum (Natural History) Expedition to Eastern Nepal. Cold winds necessitated collecting in sheltered river valleys, which accounts for the bias towards groups with aquatic immature stages, e.g. Hemerodromiinae, Clinocerinae and *Hilara*. The Empidinae, such a prominent feature of the Palaearctic fauna were poorly represented, but members of this subfamily normally appear later in the year when more flowers are out. Most of Brunetti's (1913, 1920) Empidinae from the Indian Himalayas were captured during May–June. Mr. Coe's interesting collection suggests faunistic links with the Nearctic, Oriental and Eastern Palaearctic regions. A few specimens collected by Mr. J. Quinlan on the 1954 Expedition are also included.

I thank Drs. W. N. Ellis and H. P. Duffels of the Zoölogisch Museum, Amsterdam and Dr. G. Petersen of the Deutsches Entomologische Institut, Berlin for the loan of type material, I thank Dr. T. Saigusa for a very useful exchange of Japanese material involving genera common to Nepal and Japan and for manuscript notes on his undescribed genera and species. I thank Mr. R. L. Coe and Mr. K. Hyatt for checking the Hindi and other Nepalese names used for the new species, the meanings of which are given in the text. Finally I thank my wife for her careful preparation of the typescript.

Unfortunately I have been unable to examine or obtain information on Brunetti's types in the Indian Museum, Calcutta or Collin's types in the Leningrad Museum.

This means that comparisons with these species have been from descriptions only, and some of Brunetti's are often inadequate by modern taxonomic standards. However in most cases I am satisfied that the differences described are adequate indication that separate taxa are involved. I have stated clearly the few cases where I consider my species may prove to be conspecific with described forms and feel in these cases that the ultimate loss of a species to synonymy is better than starting a chain of misidentifications.

Previously only one member of the family, *Tachydromia nepalensis* Brunetti, was recorded from Nepal. In the present paper 38 new species and 1 new subspecies are described, representing 18 genera.

All type material is in the British Museum (Natural History), London.

The nomenclature used for the male genitalia follows Bährmann (1960).

### KEY TO GENERA AND SUBGENERA KNOWN FROM NEPAL

1 All veins running straight to wing margin without forking (except for *Rs*). Cell *Cu* absent (except *Tachydromia*) . . . . . . . . . . 2
– Vein *M* always, and $R_{4+5}$ often forked. Cell *Cu* present . . . . . 7
2 (1) Humeri not differentiated . . . . . . . . . . . . . 3
– Humeri clearly differentiated . . . . . . . . . . . 6
3 (2) Veins $R_1$ and $R_{2+3}$ longer, the latter ending in costal vein well beyond middle of wing (Text-fig. 4). Front femora moderately swollen . . (***DRAPETIS*** *s.l.*) 4
– Veins $R_1$ and $R_{2+3}$ short, the latter ending in costal vein only a little beyond middle of wing (Text-fig. 6). Front femora very swollen . ***STILPON*** (p. 72)
4 (3) Distinct jowls below eyes. Second antennal segment with a distinct bristle beneath . . . . . . . . . s.g. ***CROSSOPALPUS*** (p. 71)
– No distinct jowls below eyes. Second antennal segment without a distinct bristle beneath . . . . . . . . . . . . . . 5
5 (4) No anterodorsal bristles present on hind tibiae . . s.g. ***DRAPETIS*** *s.s.* (p. 65)
– One or more strong anterodorsal bristles present on hind tibiae s.g. ***ELAPHROPEZA*** (p. 65)
6 (2) Cell *Cu* absent . . . . . . . . . . . ***SICODUS*** (p. 74)
– Cell *Cu* present . . . . . . . . ***TACHYDROMIA*** (p. 75)
7 (1) Two veins issuing from end of 1st $M_2$ cell, neither of which is forked . . 8
– *Either* three veins issuing from 1st $M_2$ cell *or* two veins with one of them forked *or* 1st $M_2$ absent . . . . . . . . . . . . . 9
8 (7) Cell *Cu* longer than cell *M* . . . . . . . . . ***HYBOS*** (p. 81)
– Cell *Cu* shorter than cell *M* and square ended . . ***STENOPROCTUS*** (p. 83)
9 (7) 1st $M_2$ cell absent . . . . . . . . . . . . . . 10
– 1st $M_2$ cell present . . . . . . . . . . . . . . 11
10 (9) Cell *Cu* present. Axillary angle of wing well developed ***BICELLARIA*** (p. 85)
– Cell *Cu* absent. Axillary angle of wing not developed . ***HEMERODROMIA*** (p. 90)
11 (9) Vein $R_{4+5}$ not forked . . . . . . . . . . . . . 12
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12 (11) Front legs raptorial, i.e., front coxae greatly elongated . . ***CHELIPODA*** (p. 94)
– Front legs not raptorial, i.e., front coxae not elongated . ***HELEODROMIA*** (p. 97)
13 (11) Cell *Cu* only about half length of cell *M*. Front coxae greatly elongated ***CHELIFERA*** (p. 98)
– Cell *Cu* as long as, or nearly as long as, cell *M*. Front coxae at most only slightly elongated . . . . . . . . . . . . . . 14

14 (13) Axillary angle of wing well developed . . . . . . **HILARA** (p. 85)
– Axillary angle of wing not developed . . . . . . . . 15
15 (14) Wings mottled brown with hyaline spots. Neck very high up on occiput **DOLICHOCEPHALA** (p. 98)
– Wings clear or brownish tinged, but not mottled with hyaline spots. . . . 16
16 (15) Clypeus distinct and elongate and with fine vibrissae and hairs (Text-fig. 50) **HYPENELLA** (p. 100)
– No distinct clypeus . . . . . . . . . . . . . . 17
17 (16) Vein $R_1$ setulose above (Text-fig. 63) . . . **TRICHOCLINOCERA** (p. 103)
– Vein $R_1$ not setulose above . . . . . . . . . . 18
18 (17) Acrostichal bristles present . . . . . **PROCLINOPYGA** (p. 104)
– Acrostichal bristles absent . . . . . . . . . . . 19
19 (18) Scutellum hairy on disc . . . . **ACANTHOCLINOCERA** (p. 101)
– Scutellum bare above . . . . . . . **CLINOCERA** (p. 106)

## TACHYDROMIINAE

### ***DRAPETIS*** Meigen

*Drapetis* Meigen, 1822, *Syst. Beschr.* **3** : 91.

No species of this genus in the restricted sense are recorded from Nepal, but I include it in the key and mention it here because usually *Elaphropeza* and *Crossopalpus* are regarded as subgenera of *Drapetis* s. l. In the present paper the three groups are treated as subgenera, *Elaphropeza* and *Crossopalpus* being represented in Nepal.

### Subgenus ***ELAPHROPEZA*** Macquart

*Elaphropeza* Macquart, 1827, *Insect. Dipt. Nord France,* **3** : 86.
*Ctenodrapetis* Bezzi, 1904, *Annls hist.-nat. Mus. natn. hung.* **2** : 355.

This subgenus is best represented in the Oriental region, but it is also well represented in N. and S. America, Africa and Australia, though only one species occurs in the Palaearctic Region. Six species are now described from Nepal.

#### KEY TO NEPALESE SPECIES OF *Elaphropeza*

1 Thorax entirely black, two or three dorsocentral bristles distinct . . ***kala*** sp. n.
– Thorax mostly reddish yellow ; dorsocentral bristles inconspicuous except for a strong prescutellar bristle . . . . . . . . . . . 2
2 (1) Arista densely long pubescent and thus appearing thicker, as an extension to the third antennal segment ; smaller species (1 mm.) . . . ***uralo*** sp. n.
– Arista normal, slender ; usually larger species (1·25 mm. or more) . . . . 3
3 (2) Thorax *and* scutellum yellow . . . . . . . . . . 4
– Thorax *or* scutellum partly black . . . . . . . . . 5
4 (3) Antennae completely yellow ; occiput yellow . . . . . . ***coei*** sp. n.
– Third antennal segment black ; occiput black . . . . . ***litoralis*** sp. n.
5 (3) Head reddish yellow except for black frons ; thorax reddish yellow, scutellum black . . . . . . . . . . . . . ***ukhalo*** sp. n.
– Head black, thorax reddish yellow with a large black spot on each side above wing bases ; scutellum yellow . . . . . . . . ***sanguensis*** sp. n.

## *Drapetis (Elaphropeza) kala* sp. n.

♀. Head shining black, lightly dusted behind, but shining on a very broad postocular band on upper two-thirds. Occiput with sparse short yellow hairs. Frons about twice width of an ocellus above, narrowing to slightly more than width of an ocellus below. Face linear. Ocellar bristles rather weak, crossing, with a pair of weak hairs behind. A pair of strong yellow outer vertical bristles and a weak inner pair. Antennae with first and second segments yellow; third segment black with base somewhat yellowish, short, less than twice as long as broad at base. Arista black, pubescent and a little less than twice antennal length. Proboscis short, brown. Palpi yellow, about two-thirds length of proboscis.

Thorax shining black (a very light dusting is evident under higher magnification), with yellow bristles. Acrostichals absent; dorsocentrals uniserial, the 3 or 4 posterior bristles strong; a notopleural and a supra-alar present. Scutellum shining black on disc with margins lightly dusted and with a pair of crossing apical bristles.

Abdomen yellowish at base, but otherwise shining black, with very light microscopic dusting and some rather long dark hairs.

Legs slender, yellow except for last tarsal segment on all legs. Preapical anterior bristle distinct on middle femora. Middle tibiae with an anterodorsal bristle at middle. Hind tibiae with two anterodorsal bristles, a little closer to each other than either is from the ends of the tibia; apical process brownish, short and broad, but pointed.

Wings clear with yellow veins. Third costal section about twice length of second section. Halteres yellow.

♂ unknown.

Length 1·5 mm.

Holotype ♀. NEPAL: Taplejung District, between Sangu and Tamrang, mixed plants by damp cliff in deep river gorge, *c.* 5,200′, i–ii.1962 (*R. L. Coe*).

Paratype ♀. Taplejung Distr., Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

This species resembles *E. basalis* Bezzi (1904 : 349), from Colombo, in size and in its predominantly black colour with yellowish base to the abdomen. It is apparently distinguished from that species by the anterodorsal bristle on the middle tibia, and the presence of two, instead of one, anterodorsal bristles on the hind tibia. The number and position of these bristles is somewhat variable within the genus, but firm differences are the shorter wings in *E. basalis* and the relative lengths of the second and third costal sections, the second vein ending midway between the first and third veins in Bezzi's species. Bezzi's type, a unique female, was in the Hungarian Museum, Budapest, but was destroyed in the autumn of 1956.

The specific name is a Nepalese word meaning " black ".

## *Drapetis (Elaphropeza) uralo* sp. n.

♂. Head shining black, only lightly dusted around neck. Frons slightly wider than an ocellus above and about as wide as an ocellus below. Face linear. Ocellar bristles sub-parallel with a pair of tiny hairs behind. A pair of strong outer vertical bristles and a weak inner pair. Antennae with first and second segments yellow; third segment black, about twice as long as broad; arista about twice length of third antennal segment, black with rather long pubescence which gives it a thickened appearance, like an extension of the third antennal segment. Proboscis yellowish, about half as long as head is deep. Palpi whitish, a little more than half as long as proboscis and with whitish hairs.

Thorax reddish yellow with a sub-triangular blackish patch above each wing base. The only obvious thoracic bristles are the single notopleural and the prescutellar dorsocentral. Pleurae reddish yellow with a blackish patch above the middle and hind coxae. Scutellum reddish yellow with a pair of crossing apical bristles.

Abdomen yellowish except for blackish middle segment and hypopygium.

Legs with coxae whitish, but otherwise yellow except for the last four tarsal segments of the front legs and the last tarsal segment of the remaining legs which are black. Middle femora with a distinct apical bristle. Middle tibiae with a distinct anterodorsal bristle at middle. Hind tibiae with two anterodorsal bristles which are obviously closer to each other than either is from the ends of the tibia; apical process short, but pointed.

Wings clear, veins yellow. Third costal section about twice as long as second costal section. Halteres yellow.

♀ unknown.

Length 1 mm.

Holotype ♂. NEPAL: Arun Valley, east shore of R. Arun below Tumlingtar, *c.* 1,800′, evergreen shrubs bordering dry stream beds, 14–23.xii.1961 (*R. L. Coe*).

Paratypes: 2 ♂, same data as Holotype.

This species resembles *E. metatarsata* Bezzi (1904 : 348) from Ceylon, in having a black thoracic spot on each side, but in that species these spots are rounded, the knobs of the halteres are black, and Bezzi described the arista as microscopically pubescent. Other species with paired black thoracic spots (*E. sanguensis* sp. n. is separated in the key) may be distinguished as follows: *E. obliquinervis* Meijere from Nonkodjadjar, has a very oblique hind crossvein (*vide* Meijere, 1913, pl. 2, fig. 19) and *E. scutellaris* Bezzi (1912 : 487) is a larger (2–2·2 mm.) species; both species apparently have a normal arista.

The specific name is from a Nepalese word meaning " down-hill ".

## *Drapetis (Elaphropeza) coei* sp. n.

(Text-fig. 1)

♂, ♀. Head reddish yellow and dusted yellow except for dull black frons and ocellar triangle. Frons narrow, barely as wide as an ocellus; eyes contiguous beneath antennae. Ocellar bristles fairly strong and the posterior pair of ocellar hairs are longer and stronger than usual. Two pairs of vertical bristles, inner pair stronger, and there are also 4 short bristles between the inner verticals. Antennae completely yellow, third segment about 1½ times as long as broad at base; arista twice antennal length. Proboscis short, yellowish. Palpi pale yellow, about half length of proboscis.

Thorax yellow. A pair of distinct, though small, upright acrostichal bristles at extreme front of thorax, but about 10 rows of hairs between the line of the dorsocentrals. Dorsocentrals uniserial with two distinct bristles behind in each row, the prescutellar being the stronger. A strong notopleural with a weaker bristle below, a supra-alar and a weak postalar. Pleurae reddish yellow. Scutellum reddish yellow with a pair of crossing apical bristles and a very weak outer pair.

Abdomen yellowish with middle segment blackish. Hypopygium yellowish.

Legs yellow except for last two tarsal segments on all legs. Preapical bristle distinct on middle femora. Hind tibiae with two (sometimes three) bristles closer to each other than either is from the tibial extremities; apical process short and broad.

Wings clear, veins yellowish. Third costal section only slightly longer than second section (about 1·2 : 1). Halteres yellow.

Length 1·5 mm.

Holotype ♂. NEPAL: Taplejung District, between Sangu and Tamrang, mixed plants by damp cliff in deep river gorge, *c.* 5,200′, 22.xi.1961 (*R. L. Coe*).

Paratypes: 27 ♂, 71 ♀, same data as Holotype; Taplejung District, between Sangu and Tamrang, mixed shrubs in deep gorge, *c.* 5,200′, x–xi.1961, 4 ♂, 10 ♀ (*R. L. Coe*); Taplejung District, below Sangu, *c.* 4,000′, mixed vegetation on sheltered slopes above river, 3.i.1962, 3 ♂, 14 ♀ (*R. L. Coe*); Taplejung, between Sangu and Tamrang, deep river gorge, *c.* 5,200′, x–xi.1961, 2♂, 5 ♀; Taplejung, between Sangu and Tamrang, wet boulder shaded permanently, in deep river gorge, *c.* 5,200′, 14.ii.1962, 1 ♀ (*R. L. Coe*); Taplejung, north of Sangu, dry grass above river bank, *c.* 5,000′, 5.i.1962, 1 ♀ (*R. L. Coe*).

This species resembles *E. metatarsata* Bezzi (1904 : 348) from Ceylon and *E. variegata* Brunetti (1913 : 42) from India in the colour of the abdomen, but both these species have dark thoracic markings and a black head. *E. fulvithorax* van der Wulp (1897 : 138) from Ceylon has the thorax completely yellowish red, but the abdomen is brown and the tips of the hind tibiae are blackish.

## ***Drapetis (Elaphropeza) litoralis*** **sp. n.**

♂, ♀. Head black, heavily dusted greyish, but narrowly shining behind eye margins on upper third. Frons very narrow, less than width of an ocellus. Face linear. Ocellar bristles short with a pair of very tiny hairs behind. A pair of distinct vertical bristles. Antennae black, first and second segments somewhat paler in some lights. Third segment a little more than twice as long as broad at base. Arista dark, pubescent and slightly less than twice antennal length. Proboscis very short, brownish, palpi short, rounded and whitish, each with a long terminal bristle.

Thorax shining reddish yellow, only dusted around margins. Acrostichals biserial. Dorsocentrals uniserial, a little longer than usual, but only the one strong prescutellar bristle. Two notopleural bristles, upper one stronger. Pleurae shining reddish yellow, somewhat dusted below. Scutellum reddish yellow, dusted, and with a pair of strong apical bristles.

Abdomen brownish, with two basal segments yellowish, dusted and with short pubescence. Hypopygium dark brownish.

Legs with femora yellowish, tibiae and tarsi brownish. Middle femora with distinct preapical anterior bristle. Hind tibiae with two strong anterodorsal bristles about middle.

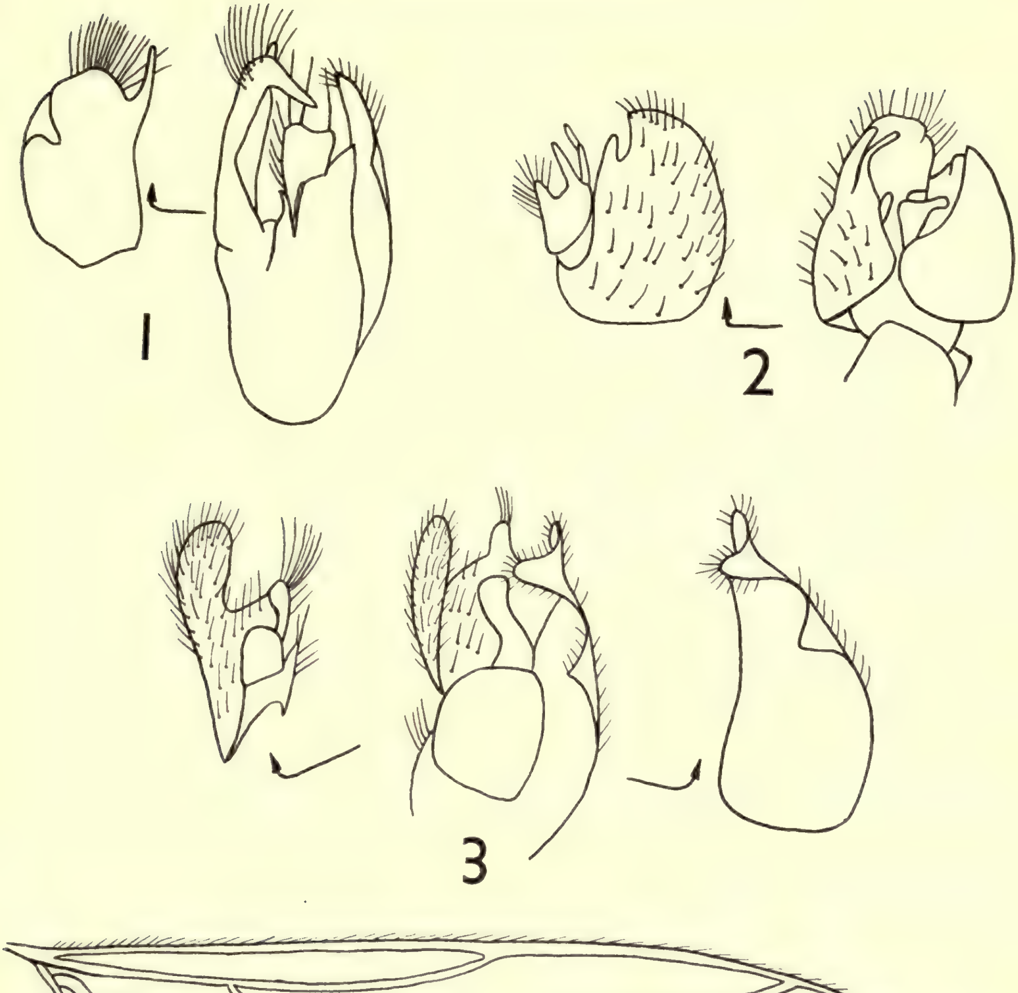
Wings clear with veins brown. Third costal section about twice length of third. Halteres yellow.

Length 1·25 mm.

Holotype ♂. NEPAL: Arun Valley, below Tumlingtar, River Sabhaya, west shore, *c.* 1,800′, dead leaves lying in sun on sandy shore, 22.xii.1961 (*R. L. Coe*).

Paratypes: 2 ♂, same data as Holotype; Arun Valley, below Tumlingtar, River Sabhaya, west shore, *c.* 1,800′, evergreen shrubs on sandy shore, 9–17.xii.1961, 1 ♀ (*R. L. Coe*).

The brownish abdomen with yellow base distinguishes this species from any Indian species. *E. fulvithorax* van der Wulp (1897 : 138), which the species most resembles, has the abdomen entirely brown and the hind tibiae have black tips.



FIGS. 1–4. *Drapetis* (*Elaphropeza*) *coei* sp. n. 1, ♂ hypopygium : *D.* (*E.*) *sanguensis* sp. n. 2, ♂ hypopygium : *D.* (*E.*) *ukhalo* sp. n. 3, ♂ hypopygium showing details of epandrium : *Drapetis* (*Crossopalpus*) *kholsa* sp. n. 4, ♀ wing.

## *Drapetis (Elaphropeza) sanguensis* sp. n.

(Text-fig. 2)

♂, ♀. Head black, dusted greyish except for broad shining postocular orbits on upper half. Occiput with some short yellow hairs. Frons narrowing from about 1½ times width of an ocellus above to width of an ocellus below; face linear. A strong pair of incurved anterior vertical bristles and a weak inner pair. An anterior pair of strong ocellar bristles with a very weak pair behind. Antennae with first and second segments yellow; third segment blackish and about 2½ times as long as broad at base; arista blackish, short pubescent and a little less than twice antennal length. Proboscis very short, brown. Palpi short, pale yellow and pale haired.

Thorax shining reddish yellow with a large elliptical black spot on each side above wing bases. A pair of short acrostichals at front of thorax; dorsocentrals uniserial, short except for a strong prescutellar bristle; a strong notopleural with a weaker bristle below. Pleurae reddish yellow with a brownish patch on each of the sternopleurae and hypopleurae, above the middle and hind coxae. Scutellum and metanotum yellow, the former with a pair of long slender crossing apical bristles.

Abdomen black, except for whitish second segment. Hypopygium black.

Legs (including coxae) yellowish, except for tarsi, knees, and hind femora in front distally, all of which are somewhat brownish. All femora slender. Middle femora with distinct preapical anterior bristle. Tibiae slender; hind tibiae with two strong anterodorsal bristles. Posteroventral apical process on hind tibiae brown, short and blunt.

Wings clear, veins brownish. Third costal section about 3 times length of second costal section. Halteres yellow.

Length 2 mm..

Holotype ♂. NEPAL: Taplejung District, between Sangu and Tamrang, mixed plants by damp cliff in deep river gorge, *c.* 5,200′, 22.xi.1961 (*R. L. Coe*).

Paratypes: 79 ♂, 67 ♀, same data as Holotype; Taplejung District, between Sangu and Tamrang, mixed shrubs in deep gorge, *c.* 5,200′, x–xi.1961, 1 ♂, 1 ♀ (*R. L. Coe*); Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962, 1 ♂, 3 ♀ (*R. L. Coe*); Taplejung District, north of Sangu, dry grass above river bank, *c.* 5,000′, 5.i.1962, 8 ♂, 8 ♀ (*R. L. Coe*); Taplejung District, Dobhan, east bank of River Tamur, *c.* 3,500′, mixed vegetation by stream in deep gully, i–ii.1962, 1 ♂ (*R. L. Coe*); Arun Valley, east shore of River Arun below Tumlingtar, *c.* 1,800′, swept from *Ricinus communis* L., 23.xii.1961, 1 ♀ (*R. L. Coe*); Arun Valley, east shore of River Arun below Tumlingtar, *c.* 1,800′, evergreen shrubs bordering dry stream beds, 14, 23.xii.1961, 3 ♀ (*R. L. Coe*); 2 miles SW. of Ulleri, 6,000–7,000′, 18.v.1954, 1 ♂ (*J. Quinlan*); Ghanpokhara, 5,500–7,000′, 2.v.1954, 2 ♂ (*J. Quinlan*).

This species resembles *E. metatarsata* Bezzi (1904 : 348) from Colombo, in having two black marks on the otherwise reddish yellow thorax and in the long slender hind metatarsi. However, Bezzi's species is a little longer, has round thoracic spots, a tooth and bristle at the base of the hind metatarsus and the halteres have dark knobs. Bezzi's type, a unique female, was in the Hungarian Museum, Budapest, but is now destroyed.

*D.* (*E.*) *sanguensis* is also very similar to the only known Palaearctic species, *E. ephippiata* Fallén, but in that species the sternopleurae are reddish yellow, the scutellum and metanotum are black, the hind metatarsus is thicker, and the hypopygium (*vide* Collin, 1961 : 41, fig. 16) is quite different.

This species closely resembles *D.* (*E.*) *binotata* Meijere, of which I have seen the type ♀, but that species has no black markings on the pleurae.

### ***Drapetis (Elaphropeza) ukhalo*** **sp. n.**

(Text-fig. 3)

♂. Head yellow and dusted yellowish except for dull blackish frons and ocellar triangle. Frons at widest point, above barely wider than an ocellus and about half this width below. Eyes contiguous below antennae. Ocellar bristles weak, crossing, with a pair of tiny hairs behind. Vertical bristles weak, the inner pair hardly distinguishable from the other pale hairs on the occiput. Antennae with first and second segments yellow; third segment black, elongate, about four times as long as broad at base; arista black, pubescent, and only slightly longer than third antennal segment. Proboscis short, brownish. Palpi short, yellow and with yellow hairs.

Thorax shining reddish yellow. Acrostichal hairs quadriserial; dorsocentrals uniserial, hairlike except for a strong prescutellar bristle. A strong notopleural with two weaker bristles below and a weak postalar. Pleurae reddish yellow except for black hypopleurae. Scutellum black with corners yellow and with a pair of strong apical bristles and weak outer pair.

Abdomen pale yellow except for blackish middle segment and hypopygium.

Legs completely yellow. Femora thickened. Middle femora with preapical anterior bristle distinct and with tiny black points ventrally, which are multiserial on basal half, but become uniserial distally. Hind femora with short but distinct anteroventral bristles, those towards tip of femur are blackish. Hind tibiae somewhat thickened, with two strong anterodorsal bristles, which are closer to each other than either is from the ends of the tibia; apical process broad and short. Hind basitarsus with at least one short, but distinct, bristle below.

Wings clear, veins yellow. Third section of costal vein 1½ times length of second section. Halteres yellow.

♀ unknown.

Length 2·5 mm.

Holotype ♂. NEPAL: Taplejung District, river banks below Tamrang Bridge, *c.* 5,500′, x–xi.1961 (*R. L. Coe*).

Paratypes: Taplejung District, between Sangu and Tamrang, mixed plants by damp cliff in deep river gorge, *c.* 5,200′, i–ii.1962, 2 ♂ (*R. L. Coe*); Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962, 1 ♂ (*R. L. Coe*).

This species resembles *E. metatarsata* Bezzi (1904 : 348) from Ceylon, and *E. variegata* Brunetti (1913 : 42) from India, in having a yellow abdomen with the middle segment black, but in both these species the head is black. *E. xanthocephala* Bezzi (1912 : 488) from Formosa is also similar and has a yellow head, but the metapleurae and the knobs of the halteres are black.

The specific name is a Nepalese word meaning " up-hill ".

### Subgenus ***CROSSOPALPUS*** Bigot

*Crossopalpus* Bigot, 1857, *Annls Soc. ent. Fr.* **5** : 563.
*Eudrapetis* Melander, 1918, *Ann. ent. Soc. Am.* **11** : 187.

Brunetti (1920:380) regarded *Crossopalpus* as a synonym of *Drapetis*, but none of the Indian species included by him under *Drapetis* appear to be referable to *Crossopalpus*.

Collin (1960 : 387), in a discussion of the *C. aenescens* Wiedemann complex, described *C. hirtipes* from Southern India.

The subgenus is world-wide in distribution. One species is now described from Nepal.

### ***Drapetis (Crossopalpus) kholsa*** **sp. n.**

(Text-fig. 4)

♀. Head black, heavily dusted grey, but shining on narrow postocular margins on upper half, and about mouth. Wide jowls below eyes. Frons about twice width of an ocellus above, narrowing to width of an ocellus below. Face very narrow, eyes closest together just below half way down from antennae, then face widening above mouth. An erect pair of divergent ocellar bristles, but no vertical bristles. Occiput with only a few extremely short hairs. Antennae with first and second segments yellow, second segment with a strong bristle beneath, third segment black, about as long as first and second segments together and with some distinct hairs below on distal half. Arista black, nearly 3 times antennal length. Proboscis short, brown. Palpi small, rounded and blackish.

Thorax black, lightly dusted but subshining and clothed with short pale hairs. A distinct prescutellar dorsocentral, two notopleurals and a postalar. Pleurae shining black except for a thin line of dust from middle coxa up to join dusted area at base of halteres, and thin bands of dust around all coxae. Scutellum black, dusted yellowish with a pair of strong marginal bristles with a tiny pair between and another tiny pair outside.

Abdomen with basal segment shining black and bare, remaining segments brownish, shining on disc, but dusted around margins and short haired.

Legs yellowish. Front and middle tibiae and all tarsi more brownish. Front femora slightly swollen. Anterior preapical bristle more or less distinct on all femora. Front and middle tibiae with antero- and posteroventral apical bristles. Hind tibiae with large apical process and a short apical anterior bristle.

Wings clear, veins brownish except for crossvein *r-m* and basal section of vein *M*. Vein *Rs* very short, second costal section a little longer than third section. Veins $R_{4+5}$ and *M* distinctly bent towards each other distally. Halteres yellow.

♂ unknown.

Length 2 mm.

Holotype ♀. NEPAL : Arun Valley, east shore of River Arun below Tumlingtar, *c.* 1,800′, evergreen shrubs bordering dry stream bed, 14–23.xii.1961 (*R. L. Coe*).

Paratype : ♀, same data as Holotype.

This species resembles the Palaearctic species *D.* (*C.*) *minima* Meigen (1838 : 100) and *D.* (*C.*) *humilis* Frey (1913 : 69) in having no anterodorsal bristles on the hind tibia. The longer arista and paler legs put this species closer to *D.* (*C.*) *humilis*, but *D.* (*C.*) *kholsa* is distinguished from both species by the longer wing, the equally convergent $R_{4+5}$ and *M*, and *r–m* being nearer the middle of the cell *M*.

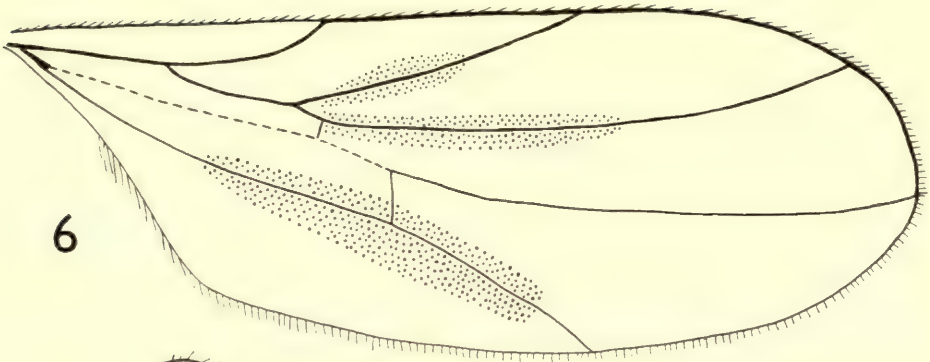
The specific name is a Nepalese word meaning " valley ".

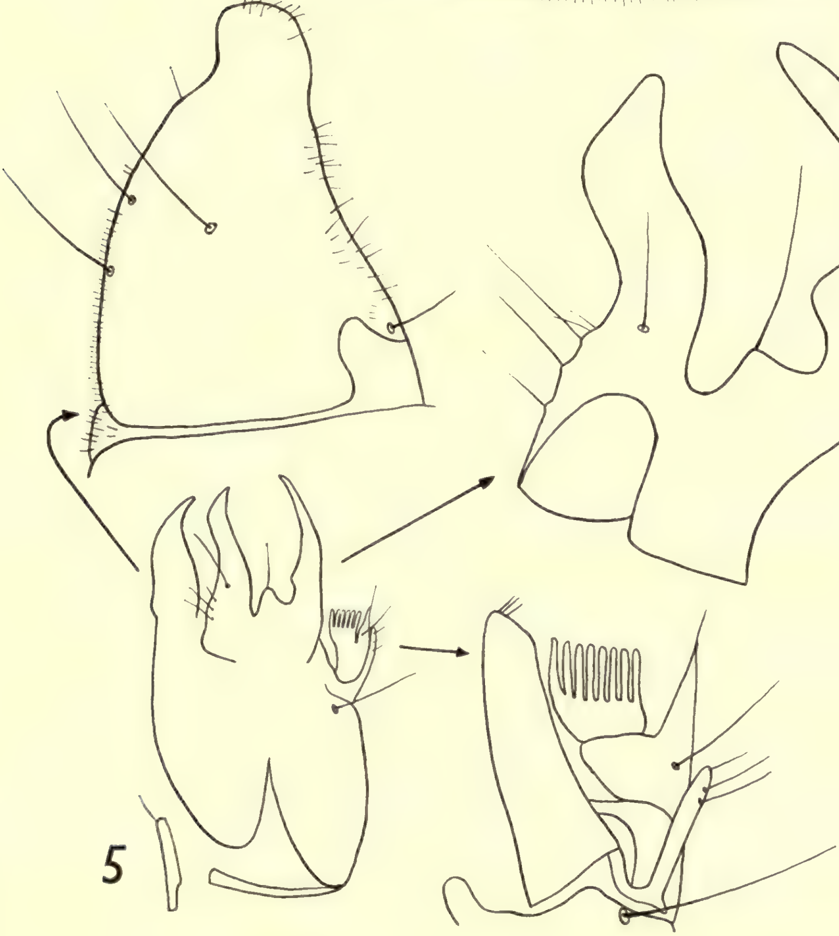
## ***STILPON*** Loew

*Stilpon* Loew, 1859, *Neue Beitr. Kenntn. Dipt.* **6** : 34.

This genus has five, possibly seven (Smith, 1965) known Palaearctic species and is otherwise only recorded from the United States of America and South Africa.

One species is now described from Nepal.





Figs. 5–6. *Stilpon divergens* sp. n. 5, ♂ hypopygium showing enlarged details of epandrium and cerci ; 6, ♂ wing.

## *Stilpon divergens* sp. n.

(Text-figs. 5, 6)

♂. Head black, heavily dusted greyish. Frons about 3 times width of an ocellus, eyes contiguous below antennae. A pair of tiny, slightly convergent ocellar bristles with two pairs of tiny bristles behind. A pair of short crossing vertical bristles. Occiput with sparse short hairs above and a few longer pale bristly hairs behind mouth. Antennae with first and second segments yellow, second segment with 2 strong bristles below, one short, one long ; third segment black, extremely short, shorter than second segment and with a few longish hairs at tip. Arista black, subapical, 3 times antennal length and pubescent. Proboscis brown, about one-third head height. Palpi short, yellow and with a strong black apical bristle.

Thorax black, dusted greyish. Disc of thorax with about 6 rows of short brownish bristly hairs. A distinct humeral, a tiny posthumeral, a distinct notopleural and a distinct postalar. Pleurae black, dusted greyish. Scutellum black, dusted greyish with a pair of fairly strong convergent apical bristles.

Abdomen pale and fleshy except for the black complex hypopygium.

Legs (including coxae) yellow except for slightly darkened front tibiae and blackish distal three-quarters of hind femora and last tarsal segment of all legs. Front femora strongly swollen and with some posteroventral bristles. Middle femora with a strong preapical anterior bristle and 3 posteroventral bristles on basal half. Hind femora with a row of short slender anteroventral bristles, two or three of which, towards tip, are longer. Legs otherwise rather short haired.

Wings clouded brownish about veins. Vein $R_{2+3}$ joining costal vein beyond centre of wing. Main veins divergent. Halteres with yellow stem and black knob.

♀ similar to male, but terminal abdominal segments laterally compressed ; anal papillae with some rather long bristly hairs.

Length 1 mm.

Holotype ♂. NEPAL : Taplejung District, between Sangu and Tamrang, mixed shrubs and plants by damp cliff in deep river gorge, *c.* 5,200′, x–xi.1961 (*R. L. Coe*).

Paratypes : 4 ♀, same data as Holotype.

This species may be distinguished from all Old World species by the long vein $R_{2+3}$ which joins the costal vein beyond the middle of the wing and by the distinctive genitalia.

## *SICODUS* Rafinesque

*Sicodus* Rafinesque, 1815, ***Analyse de la Nature***, 130.
*Tachista* Loew, 1864, ***Z. Ent.*** **17** : 15.

This genus is mainly a Palaearctic one, but also occurs in Africa, Formosa and North America. Brunetti (1920 : 375–376) described *Tachydromia latifascipennis* from India, but I have studied specimens in the British Museum determined by Brunetti and they clearly belong to *Sicodus*. Only one species was taken on the Nepal Expeditions, represented by a damaged female, belonging to the *S. annulimanus* Mg.–*S. calceana* Mg. group.

### *Sicodus* sp.

Shining black species, dusted about neck and on scutellum, thoracic bristle strong. Legs with coxae yellow ; front femora yellow ; middle and hind femora black ; all tibiae blackish ;

tarsi yellow except for darkened last two segments. Wings with the two dark transverse bands broadly joined along anterior edge.

Nepal: Arun Valley, below Tumlingtar, River Sabhaya, west shore, *c.* 1,800′, evergreen shrubs on sandy shore, 9–17.xii.1961, 1 ♀ (*R. L. Coe*).

## *TACHYDROMIA* Meigen

*Tachydromia* Meigen, 1803 in Illiger, *Mag. Ins.* **2** : 269.
*Platypalpus* Macquart, 1827, *Mém. Soc. Sci. Lille,* **3** : 92.
*Howlettia* Brunetti, 1913, *Rec. Ind. Mus.* **9**: 23

*Tachydromia* is almost world-wide in distribution, but is best represented in the northern temperate regions. *T. nepalensis* (Brunetti) has previously been described from Nepal (Brunetti, 1913, 1920) and 7 new species are now described.

### Key to Nepalese Species of *Tachydromia*

| | | | |
|---|---|---|---|
| 1 | | Large (4·0 mm.) species with very long palpi (Text-fig. 7) | ***brunettii*** (Melander) |
| – | | Smaller (2·0 mm.) species with smaller palpi | 2 |
| 2 | (1) | Thorax black | 3 |
| – | | Thorax partly yellow | 7 |
| 3 | (2) | Costa intensely blackened for basal 2/3 between end of vein $R_1$ and end of vein $R_{2+3}$ (Text-fig. 10) | 4 |
| – | | Costa not as above | 5 |
| 4 | (3) | Antennae black. Tibiae black, front and middle femora with a black band. Male genitalia large | ***tapa*** sp. n. |
| – | | First and second antennal segments yellow. Legs yellow. Male genitalia small | ***sanguensis*** sp. n. |
| 5 | (3) | Middle and hind femora black on apical half and all tibiae blackish | ***shealsi*** sp. n. |
| – | | Legs with less extensive black markings | 6 |
| 6 | (5) | Legs of male yellow | ***taplejungensis*** sp. n. |
| – | | Front and hind femora blackish above at tip. Middle femora brownish on anterior face | ***kosi*** sp. n. |
| 7 | (2) | Thorax reddish yellow with a black median stripe which broadens posteriorly to include whole of scutellum | ***quinlani*** sp. n. |
| – | | Thorax without a black median stripe | 8 |
| 8 | (7) | Thorax entirely reddish yellow, scutellum black | ***narangi*** sp. n. |
| – | | Thorax with a short black streak above each wing, apparently joined behind by an irregular blackish mark, scutellum yellow | ***nepalensis*** Brunetti |

## *Tachydromia brunettii* (Melander)

(Text-fig. 7)

(*Platypalpus brunettii* Melander, 1927, *Gen. Ins.* **185**: 349 [n.n. for *H. flavipes* Brunetti; 1913: 23]

♀. Head black, completely and heavily dusted greyish except for shining frons and face. Frons twice ocellar width at level of front ocellus, narrowing to ocellar width below. Face about as wide as an ocellus. Occiput rather densely pale haired above and with long pale bristly hairs below. A pair of widely divergent ocellar bristles and two pairs of small vertical bristles. Antennae dark brownish; first segment longer than second segment and third segment short, hardly as long as first and second segments together and hairy. Arista black, long, about $2\frac{1}{2}$ times antennal length and obviously pubescent. Proboscis about half head height, brownish. Palpi yellow and very large, with fine pale hairs.

Thorax black, only lightly dusted and subshining on disc, but heavily and broadly dusted around margins, over humeri and on a triangle behind humeri. Thorax with even short pale pubescence ; a slender prescutellar dorsocentral ; two notopleurals, upper one stronger ; a weak postalar. Pleurae black, densely dusted greyish, but sternopleurae shining black except for upper hind corner. Scutellum black, dusted greyish, with a pair of crossing apical bristles and a weak outer pair of hairs.

Abdomen tergites black, sternites pale brownish ; clothed with sparse pale hairs.

Legs (including coxae) yellow, except for last four tarsal segments of all legs which are darkened. Front femora slightly swollen. Middle femora strongly swollen with two ventral rows of short black spines and a posteroventral row of bristles. Hind tibiae distinctly curved. Legs short haired without outstanding bristles other than those described on middle femora.

Wings clear, veins brown. Veins $R_{4+5}$ and $M$ very gently convergent distally. Halteres yellow.

♂ unknown.

Length 4 mm.

NEPAL : Taplejung District, damp evergreen oak forest above Sangu, *c.* 8,500′, 2–26.xi.1961, 1 ♀. (*R. L. Coe*).

This large species resembles *T. orientalis* Brunetti (1920 : 378) from Darjiling and *T. valens* Melander (1927 : 366) from Java, but the former has a parallel-sided dusted frons and the latter has a linear face and a large tibial spur. Compared with type ♀, Mussoorie, in British Museum (Nat. Hist.).

### *Tachydromia tapa* sp. n.

(Text-fig. 8)

♂. Head black, dusted greyish except for the shining frons. Frons about twice ocellar width, narrowing to slightly more than ocellar width above antennae. Face narrow, only half as wide as an ocellus. A pair of divergent ocellar bristles. Occiput pale haired, the hairs on lower part longer. Antennae black, third segment elongate, twice length of first and second segments together ; arista black, about three-quarters length of third segment. Proboscis black, rather slender and a little more than half as long as head is deep. Palpi yellow, about half as long as proboscis.

Thorax : shining black, with sparse microscopic pubescence ; anteriorly the hairs in the outer acrostichal series are directed outwards, all other hairs being directed backwards. Heavily dusted on a very narrow transverse band in front of scutellum. The only distinct bristles are two notopleurals, the uppermost being the stronger and a weak prescutellar dorsocentral. Pleurae black, dusted greyish, but sternopleuron and mesopleuron largly shining. Scutellum black, dusted greyish with a pair of crossing apical bristles and a weaker outer pair.

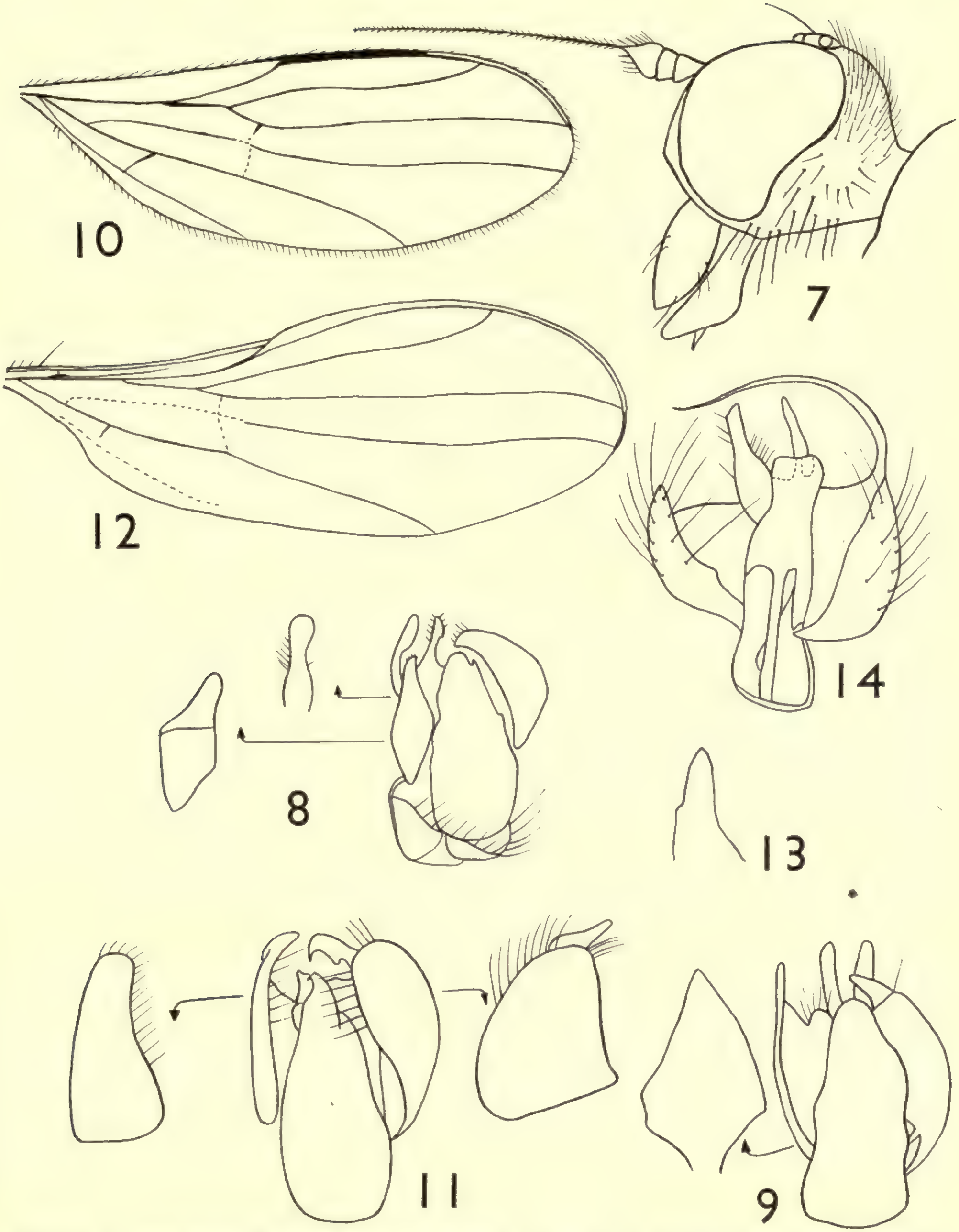
Abdomen shining black with sparse short pale hairs and a fringe of longer hairs on the pregenital sternite. Hypopygium large and black, dusted greyish.

Legs coxae yellow. Front femora yellow. Middle femora only slightly swollen, yellow, with a broad black band beyond middle ; hind femora with a black preapical band. All tibiae black, more or less yellowish at base ; tarsi black. Front tibiae with very short erect bristles above on distal half.

Wings clear, veins brownish, but second costal section intensely blackened on basal three-quarters. Cells $R$ and $M$ of equal length. Veins $R_{4+5}$ and $M$ gently diverging basally, but almost parallel distally. Halteres yellow.

♀ unknown.

Length 2 mm.



Figs. 7–14. *Tachydromia* spp. *T. brunettii* (Mel.) 7, head : *T. tapa* sp. n. 8, ♂ hypopygium showing orientated details of epandrium and cercus : *T. sanguensis* sp. n. 9 ♂ hypopygium ; 10, wing : *T. shealsi* sp. n. 11, hypopygium showing details of epandrium ; 12, wing : *T. kosi* sp. n. 13, lateral lamella of epandrium of hypopygium : *T. taplejungensis* sp. n. 14, hypopygium.

Holotype ♂. NEPAL : Taplejung District, damp evergreen oak forest above Sangu, *c.* 9,200′, 2–26.xi.1961 (*R. L. Coe*).

This and the following species resemble *T. gentilis* Brunetti (1920 : 377) from Darjiling and Simla, but that species has the scutellum shining black and the costa is not darkened on the basal three-quarters. The costal character is reminiscent of the European *T. stigmatella* Zetterstedt, but that is a larger (2·5–3·0 mm.) species, with yellow legs, a shining black head and different genitalia.

The specific name is a Nepalese word meaning " summit " (of hill or mountain).

## *Tachydromia sanguensis* sp. n.

(Text-figs. 9, 10)

♂. Head black, dusted greyish, but frons only lightly so and therefore subshining. Frons 3 times ocellar width at level of first ocellus, narrowing to about slightly more than ocellar width above antennae. Face about half ocellar width. A pair of weak ocellar bristles, shorter than in *T. tapa*. Occiput with short pale pubescence above and longer pale hairs below. Antennae with first and second segments yellow ; third segment black, less than twice length of first and second segments together ; arista black, a little longer than third antennal segment. Proboscis brownish, slender and a little more than half as long as head is deep. Palpi whitish, about half as long as proboscis.

Thorax shining black on disc but greyish dusted around margins and over humeri, especially on a prescutellar band about as broad as third antennal segment is deep. Thoracic pubescence yellow, short and sparse ; anteriorly, the hairs of the outer acrostichal series are directed outwards, but all other hairs are directed backwards. Bristles yellow. A distinct, though weak, notopleural, a similar prescutellar dorsocentral and a very weak postalar. Pleurae black, dusted greyish, but mesopleurae and sternopleurae largely shining. Scutellum black, dusted greyish with a pair of crossing apicals and a weak outer pair.

Abdomen shining black with sparse short pale hairs and a fringe of longer hairs on the pregenital sternite. Hypopygium small and black.

Legs yellow with the last tarsal segment somewhat darkened. Middle femora only slightly swollen. Front tibiae without the short erect bristles above which are present in *T. tapa*.

Wings clear, veins brownish, but second costal section intensely blackened as in *T. tapa*. Venation otherwise resembling that species, but wings longer. Halteres pale yellow.

♀. Similar to male, except for abdominal terminalia.

Length 1·5 mm.

Holotype ♂. NEPAL : Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

Paratypes : 3 ♀, same data as Holotype ; Taplejung District, edge of mixed forest above Sangu, *c.* 6,500′, 17.x–i.xi.1961, 1 ♀ (*R. L. Coe*) ; Taplejung District, between Sangu and Tamrang, mixed plants in deep river gorge, *c.* 5,200′, 22.xi.1961, 1 ♀ (*R. L. Coe*).

## *Tachydromia shealsi* sp. n.

(Text-figs. 11, 12)

♂. Head black, dusted greyish. Frons nearly twice ocellar width at level of first ocellus. Face linear, broadening above mouth, silvery. Ocellar bristle divergent. Two pairs of vertical bristles. Occiput medium haired above, with longer pale hairs below. Antennae with first and second segments yellow ; third segment black, short and hairy apically below ; arista sub-apical, black and a little longer than antenna. Proboscis shining black and a little more than half head height. Palpi short, black and with a strong bristle at tip.

Thorax black, lightly dusted greyish, bristles and hairs yellow. Acrostichal bristles quadriserial. Only one strong posterior dorsocentral with a few biserial hairs in front of it. A weak humeral ; two notopleural bristles, lower one weaker ; a weak postalar and some bristly hairs between the dorsocentrals and the notopleurals. Pleurae black lightly dusted greyish, but sternopleurae largely shining. Scutellum black, heavily dusted greyish and with two crossing apical bristles.

Abdomen shining black with a narrow band of dust across the anterior margin of each tergite, sparsely haired. Hypopygium black, dusted greyish.

Legs with coxae yellow ; front femora yellow except for a blackish patch above at tip ; middle and hind femora yellow on a little less than basal half, remainder black ; middle femora hardly swollen ; all tibiae blackish ; all tarsi with first two segments yellow, remainder black. Hairs of medium length, but no outstanding bristles except for the short posteroventrals on middle femora.

Wings clear, veins brownish. Second costal section thickened on basal half. Veins $R_{4+5}$ and $M$ gently convergent distally.

♀ unknown.

Length 2 mm.

Holotype ♂. NEPAL : Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

Paratypes : 2 ♂, same data as Holotype ; Taplejung District, Sangu, spray-splashed rocks in shallow ravine, *c.* 6,200′, 13.i.1962, 1 ♂ (*R. L. Coe*).

This, and the following species, are similar to the Javanese *T. maculifemur* Meijere (1914 : 78) and *T. maculifemoratus* Melander (1927 : 358), but the former has a patch of dust on each side of the thorax in front of the posterior callus, brown legs and the middle femora without blackish marks, while the latter has blackish marks on only the middle legs.

## ***Tachydromia kosi*** **sp. n.**

(Text-figs. 13)

♂. Very similar to *T. shealsi*, but differing as follows : Antennae completely black ; arista apical and about 1½ times antennal length ; palpi smaller. Hypopygium very similar, but the slender lateral lamella is of a different shape. Front femora as in *T. shealsi* with an apical black spot above but middle femora moderately swollen and only obscurely blackish on anterior and posterior faces with the tips, base, dorsal and ventral surfaces yellow ; hind femora obscurely blackish on anterior and posterior faces for distal half, and black above at tip ; all tibiae yellow but anterior tibiae vaguely darkened about middle ; tarsi with last three segments darkened. Wings with basal half of second costal section not so obviously thickened and with veins $R_{4+5}$ and $M$ parallel distally.

♀ unknown.

Holotype ♂. NEPAL : Taplejung District, river banks below Tamrang Bridge, *c.* 5,500′, x–xi.1961 (*R. L. Coe*).

The specific name means " river ".

### *Tachydromia taplejungensis* sp. n.

(Text-fig. 14)

♂. Head black, dusted greyish, frons about twice ocellar width, face a little wider than an ocellus. A pair of divergent ocellar bristles and a pair of incurved vertical bristles. Occiput with short pale hairs above and longer pale bristly hairs below. Antennae black, third segment about 1½ times length of first and second segments together. Arista black and only slightly longer than antenna. Proboscis black, about three-quarters head height. Palpi yellow and very small with a bristle at tip.

Thorax black, humeri and postalar calli brownish, only microscopically dusted on disc, hence subshining but more heavily dusted around margins. No distinct acrostichals as the thorax is clothed with short fine even pubescence. One distinct prescutellar dorsocentral. A tiny humeral; two notopleurals, upper one stronger and a weak postalar. Pleurae black, dusted greyish, but sternopleurae largely shining except for dusted upper margin. Scutellum black, dusted greyish with a pair of crossing apical bristles.

Abdomen blackish, short haired, but hypopygium with longer hairs and the epandrium with a long slender sickle-shaped process above.

Legs yellow, short haired; middle femora swollen, with two rows of short black spines beneath and a row of short posteroventral bristles, otherwise legs without strong bristles.

Wings clear with veins brown. Veins $R_{4+5}$ and $M$ parallel distally. Halteres yellow.

♀ unknown.

Length 2·5 mm.

Holotype ♂. NEPAL: Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

Paratype: ♂, Taplejung District, below Sangu, edge of small mixed wood, *c.* 6,000′, 4.xi.1961 (*R. L. Coe*).

Similar to *T. gentilis* Brunetti, but that species has the scutellum shining black and the antennae brownish yellow.

### *Tachydromia narangi* sp. n.

♀. Head black, heavily dusted greyish. Frons about twice ocellar width and face hardly as wide as an ocellus. A pair of slightly divergent ocellar bristles and two pairs of vertical bristles. Occiput with a few short pale hairs above and some longer pale bristly hairs below. Antennae yellow, third segment short and rounded, only as long as first and second antennal segments together. Arista black and twice antennal length. Proboscis yellow with a brown tip, about half head height. Palpi yellow, short.

Thorax orange-yellow, shining on disc, but narrowly dusted at sides and on humeri. Acrostichals irregularly biserial; dorsocentrals uniserial, longer posteriorly with a strong prescutellar; a strong notopleural with a much weaker bristle and a few hairs below; a very strong postalar bristle present. Pleurae orange-yellow but yellowish dusted except for sternopleural spot; also there is a narrow black streak down the hind margin of the sternopleuron. Scutellum black, lightly dusted, with a strong pair of crossing apical bristles and a very weak pair of outer hairs. Mesonotum black.

Abdomen with first four segments black, only lightly dusted and thus subshining; the last segment is also dark, but rather heavily dusted; remaining segment and anal papillae yellow.

Legs (including coxae) yellow except for last tarsal segment on all legs. Front femora slightly swollen; middle femora strongly swollen with two rows of black ventral spines and a posteroventral row of bristles which are long and strong on basal half. Hind femora slender, with a ventral row of minute spaced points. Middle tibiae with an apical process as long as tibia is broad at tip, rounded apically.

Wings clear, veins yellow. Veins $R_{4+5}$ and $M$ very slightly convergent distally. Halteres yellow.

♂ unknown.

Length 2 mm.

Holotype ♀. NEPAL: Ghanpokhara, 5,500–7,000′, 2.v.1954 (*J. Quinlan*).

This species resembles *T. nepalensis* Brunetti, but in that species there is a short black streak above each wing and the scutellum is ferrugineous.

The specific name means " orange ".

### ***Tachydromia quinlani*** **sp. n.**

♀. Resembling *T. narangi*, but differing as follows: Arista shorter, hardly 1½ times antennal length. Thorax with a wide black median stripe, which widens posteriorly to equal width of the black scutellum and metanotum; the upper notopleural and the postalar bristles are strong, but the prescutellar dorsocentral is not as strong as usual; otherwise the thorax is clothed with fine, pale, rather long hairs. Abdomen shining blackish with sparse pale hairs. The black spaced points on the hind femora are longer and stronger than in *T. narangi*.

♂ unknown.

Holotype ♀. NEPAL: 2 miles SW. of Ulleri, 6,000–7,000′, 18.v.1954 (*J. Quinlan*).

This species is similar to *T. ferruginea* Brunetti (1920: 376), but in that species the head is brownish yellow, and there is an abbreviated stripe on each side of the median stripe.

### ***Tachydromia nepalensis*** Brunetti

*Brevios longicornis* Brunetti, 1913, *Rec. Indian Mus.* **9**: 22.

*Tachydromia nepalensis* Brunetti, 1920, *Fauna of British India,* **1**: 377 [n.n. for *B. longicornis* Brunetti].

This species was described from a unique male from Sarath, 24.ii.1908, and has not been taken since.

## HYBOTINAE

### ***HYBOS*** Meigen

*Hybos* Meigen, 1803 in Illiger *Mag. Ins.* **2**: 269; 1804, *Klass. Z. Ins.* **1**: 239.

This genus is almost world-wide in distribution, but is better represented in the Oriental and Austro-oriental regions than in the Palaearctic. Two species are now described from Nepal.

### ***Hybos aimai*** **sp. n.**

(Text-figs. 15, 16)

♀. Head black, dusted greyish. Eyes with upper facets enlarged, contiguous above antennae, but separated below antennae by a short broad face which is heavily dusted grey. A pair of distinct ocellar bristles and occiput with a postocular fringe of bristly hairs which are bent forward at tip. Occiput otherwise with short dark hairs and a few pale hairs below. Antennae black, third segment about twice as long as broad, arista black and about twice antennal length. Proboscis dark brown, directed forwards. Palpi black, not quite as long as proboscis, and with some bristles beneath.

Thorax arched, black, heavily dusted brownish. A weak humeral bristle; acrostichals quadriserial; dorsocentrals uniserial, ending with a strong bristle on front margin of prescutellar depression; two notopleural bristles, upper one stronger; a postalar. Pleurae black, dusted greyish. Scutellum black, heavily dusted yellowish with a pair of strong black apical bristles and two outer pairs of pale hairs.

Abdomen shining black except for a narrow band of light dust on the anterior margins of tergites with sparse short dark hairs above and longer pale hairs laterally. Terminalia with a tuft of bristly hairs and a pair of upright anal papillae.

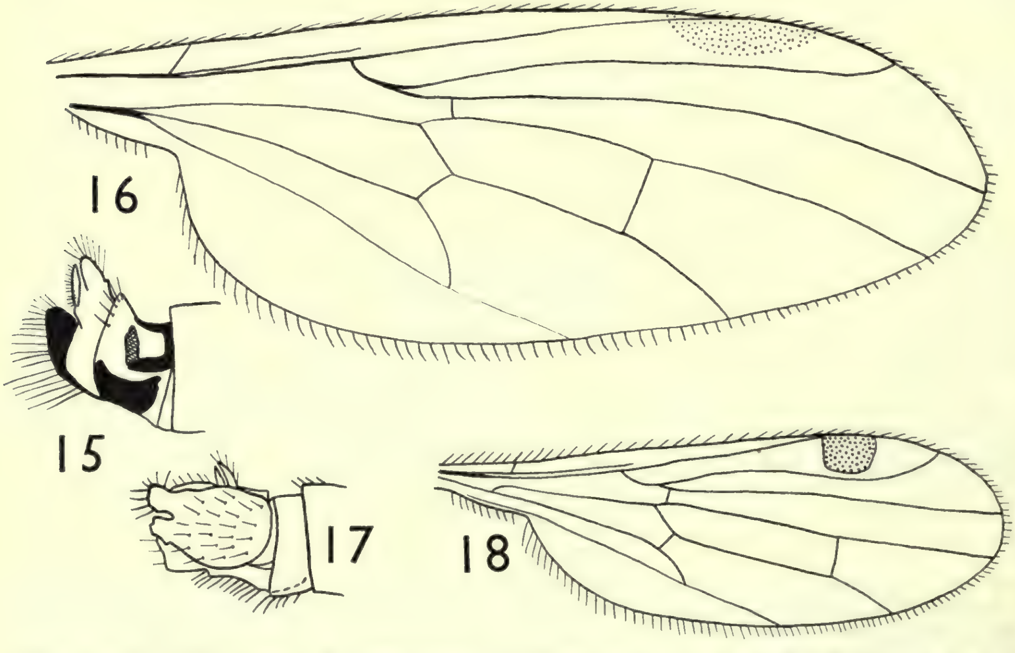
Legs shining black. Front and middle femora with pale slender posteroventral bristles. Hind femora with a black slender, anterodorsal bristle at middle and another at distal three-quarters; pale slender posteroventral bristles, longer on distal half; a row of short but strong black anteroventral bristles and a ventral row of short black tuberculate spines. Front tibiae with a short anterodorsal bristle, a long anterodorsal apical bristle, other apical bristles short. Middle tibiae with a very long anteroventral apical bristle, other apical bristles shorter; an anterodorsal bristle at middle and another near base. Hind tibiae with a very slender dorsal bristle near tip. Tarsi longer and sparser haired above, short and thicker haired below, without bristles.

Wings clear with a long faint stigma. Halteres yellow.

♂ unknown.

Length 3·5 mm.

Holotype ♀. NEPAL: Taplejung District, between Sangu and Tamrang, *c.* 5,500′, open ground by hill stream, 20–23.x.1961 (*R. L. Coe*).



FIGS. 15–18. *Hybos* spp. *H. aimai* sp. n. 15, ♀ terminalia; 16, wing: *H. bhainse* sp. n. 17, ♂ hypopygium; 18. wing.

Paratypes: Taplejung District, between Sangu and Tamrang, mixed shrubs in deep gorge, *c.* 5,200′, x–xi.1961, 2 ♀ (*R. L. Coe*); Taplejung District between Sangu and Tamrang, mossy ground under bush by hill stream, 20.x.1961, *c.* 5,500′, 1 ♀ (*R. L. Coe*).

This species most resembles *H. nigronitidus* Brunetti (1920 : 342) from India, but in that species the thorax is shining black.

The specific name is a Nepalese word meaning " woman ".

### *Hybos bhainse* sp. n.

(Text-figs. 17, 18)

♂. Head black, dusted brownish. Eyes with upper facets slightly enlarged, contiguous above antennae, face linear. Ocellar bristles divergent. Occiput with black bristly hairs. Antennae black, third segment a little longer than first and second segments together; arista black, about 3 times antennal length. Proboscis short, black, palpi black.

Thorax arched, black, dusted brownish but subshining on disc and humeri. Two humeral bristles, two notopleural bristles, upper one stronger; acrostichals biserial, dorsocentrals uniserial ending with a strong bristle at front margin of prescutellar depression; a postalar. Scutellum shining black on disc, dusted brownish around margins with a pair of divergent apical bristles and two pairs of weak outer hairs. Pleurae black, dusted brownish.

Abdomen shining black with short dark hairs above and longer pale hairs at sides. Hypopygium black.

Legs black with all metatarsi and second tarsal segments of front and middle legs yellow. Front and middle femora without distinct bristles. Hind femora with strong tuberculate spines ventrally, irregularly biserial on basal half, but uniserial distally. Front tibiae short haired anteriorly, long haired posteriorly; with the posteroventral the longest of the circlet of slender preapical bristles. Middle tibiae with distinct anterodorsal bristles and a long slender posteroventral preapical bristle. Hind tibiae with distinct anterodorsal bristles and a long slender posterodorsal preapical. Front and middle tarsi with circlets of long bristly hairs; hind tarsi with short bristly hairs above.

Wings somewhat brownish tinged, stigma short, squarish and dark. Halteres black.

♀. Similar to male, but hind femora more slender and abdomen terminating in two bristly papillae.

Length 3 mm.

Holotype ♂. NEPAL: Taplejung District, above Sangu, *c.* 6,500′, evergreen scrub, 5–13.x.1961 (*R. L. Coe*).

Paratype: ♀, Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, ix.x–1961 (*R. L. Coe*).

This species resembles *H. geniculatus* Wulp (1897 : 137) from Ceylon in having the legs partly yellow, but that species has whitish halteres.

The specific name is a Nepalese word meaning " buffalo ".

### ***STENOPROCTUS*** Loew

*Stenoproctus* Loew, 1858, *Öfvers. VetenskAkad. Förh., Stockh.* **15** : 340.
*Stenoproctus* Loew; Loew, 1860, *Abh. naturw. Ver. Sachsen* **2** : 261.
*Acanthopeza* Becker, 1914, *Annls Soc. ent. Fr.* **83** : 122.

This genus has previously only been recorded from the Ethiopian region. The type species, *S. unipunctatus* Loew, was described from the Cape of Good Hope. Becker (1914) described a second species, *S. sylvaticus* (under *Acanthopeza*) from East Africa and Jones (1940) described three species from the Ruwenzori region. I refer one species from Nepal to this genus, although the hind femora are simple and slender, in this feature resembling an undescribed species I have seen from Africa. When males are known, it may be advisable to erect a new genus for this and the African species.

## *Stenoproctus nepalensis* sp. n.

(Text-fig. 19)

♀. Head black, heavily dusted greyish. Eyes contiguous above antennae, face about as broad as third antennal segment is deep. Slender ocellar bristles, curved forwards and slightly divergent. Occiput with sparse pale hairs. Antennae black, third segment a litle more than twice length of first and second segments together, the apical arista slightly longer than antenna. Proboscis short, directed forward. Palpi black.

Thorax rather high and arched ; black, heavily dusted greyish around broad margin, but disc somewhat lighter, brownish dusted. Thoracic pubescence short, sparse and pale, except for a notopleural bristle, a dorsocentral at anterior corner of prescutellar depression, and a weak postalar. Pleurae black, dusted greyish. Scutellum black, dusted yellowish with 4 equally strong marginal bristles and several pale hairs.

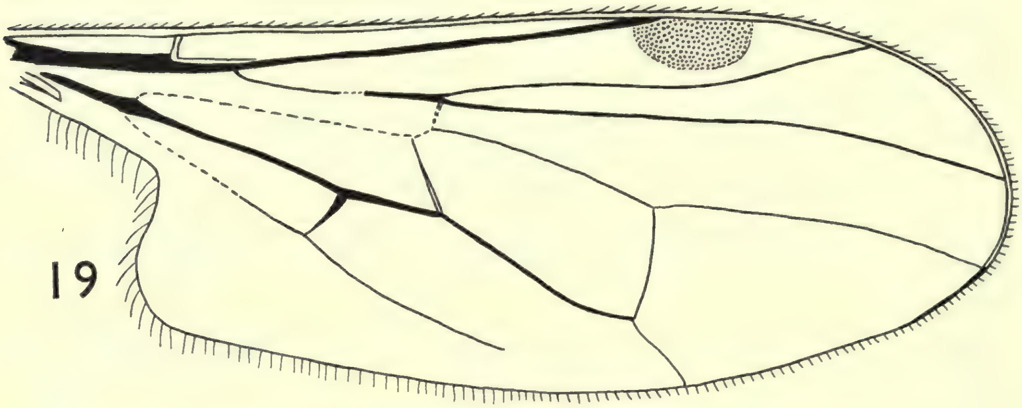


FIG. 19. *Stenoproctus nepalensis* sp. n. ♀ wing.

Abdomen brownish, dulled by yellowish dust and with short sparse pale hairs.

Legs slender, pale brown, but hind tibiae and all tarsi dark brown. Front and middle femora with short slender posteroventral bristles, short haired above ; hind femora slender with additional longer posteroventral bristles on distal half, a weak series of anteroventral bristles with a few longer curved bristles at tip and with some upright bristly hairs above on basal half. Front tibiae with rather long bristly hairs and a long anterodorsal subapical bristle and a similar posteroventral bristle. Middle tibiae with a long brown anterodorsal bristle at basal quarter, a shorter pale anteroventral bristle at middle and a slender apical bristle in the antero- and posteroventral positions. Hind tibiae with a strong brown anterodorsal bristle at basal third, and some slender posterodorsal bristly hairs which become longer towards tip ; two slender pale anteroventral bristles about middle and with rather short dense hairs below on distal third.

Wings clear, veins dark brown. Cell $Cu$ square ended and much shorter than cell $M$. Vein $1A$ continued to wing margin. $Rs$ (the common stem of $R_{2+3}$ and $R_{4+5}$) long. A distinct brownish stigma below tip of vein $R_1$. Axillary angle well developed. Halteres yellow.

♂ unknown.

Length 2·5 mm.

Holotype ♀. NEPAL: Arun Valley, below Tumlingtar, River Sabhaya, west shore, *c.* 1,800′, dead leaves lying in sun on sandy shore, 22.xii.1961 (*R. L. Coe*).

Paratype: ♀, same data as Holotype.

This species is distinguished at once from all described species by the slender simple hind femora.

## OCYDROMIINAE

### *BICELLARIA* Macquart

*Bicellaria* Macquart, 1823, *Mém. Soc. Sci. Lille*, 1819–22 : 155.
*Cyrtoma* Meigen, 1824, *Syst. Beschr.* **4** : 1.
*Enicopteryx* Stephens, 1829, *Syst. Cat. Brit. Ins.* **2** : 264.

This genus is known only from the Palaearctic and Nearctic regions. One species has been taken in Nepal which is very close to the Palaearctic *B. vana* Collin, but since this is represented by only a damaged male I am reluctant to comment further until more material is available.

### ***Bicellaria*** sp.

NEPAL: Ghanpokhara, 5,500–7,000′, 2.v.1954, 1 ♂ (*J. Quinlan*).

## EMPIDINAE

### *HILARA* Meigen

*Hilara* Meigen, 1882, *Syst. Beschr.* **3** : 1.

This genus is almost world-wide in distribution with a large number of described species. Unfortunately, many descriptions are inadequate, which has made taxonomic studies difficult. It is essential that the male genitalia be dissected and studied in detail and illustrated in descriptions.

Three species are now described from Nepal and are distinguished from other Himalayan species by the following key. At least another 4 species are represented by females only and are thus not described.

KEY TO KNOWN HIMALAYAN SPECIES OF *Hilara*

| | | | |
|---|---|---|---|
| 1 | | Wings brownish tinged | 2 |
| – | | Wings clear | 4 |
| 2 | (1) | Thorax light yellowish brown with 3 black stripes | ***rufithorax*** Brunetti |
| – | | Thorax brownish or blackish | 3 |
| 3 | (2) | Blackish species. Middle femora with a long slender ventral bristle near base | ***bhiga*** sp. n. |
| – | | Brownish species. Middle femora without such a bristle | ***bares*** Walker |

4 (1) Halteres brownish yellow . . . . . . . . **compacta** Brunetti
– Halteres black . . . . . . . . . . . . . . . 5
5 (4) Acrostichal bristles biserial . . . . . . . . . **gila** sp. n.
– Acrostichal bristles quadriserial . . . . . . . . . . . . 6
6 (5) Legs brown. Front basitarsus of ♂ greatly swollen . **peshawarensis** Brunetti
– Legs yellow, except for brownish tarsi. Front basitarsus of ♂ moderately swollen . . . . . . . . . . **khola** sp. n.

## *Hilara gila* sp. n.

(Text-figs. 20–23)

♂. Head black, heavily dusted brownish grey. A pair of frontal bristles and a strong pair of widely divergent ocellar bristles. Some long postocular bristly hairs curved forward over eye-margins on upper half of head. Antennae black, style about two-thirds length of third segment. Proboscis black. Palpi black, with a long black ventral bristle.

Thorax black, heavily dusted brownish grey. A small humeral, intrahumeral and posthumeral present. Acrostichals rather short, biserial; dorsocentrals a little longer, uniserial and ending in a longer prescutellar bristle. A notopleural with a short bristle in front and another behind, a supra-alar and a postalar present. Pleurae bare, brownish grey dusted. Scutellum greyish dusted with two pairs of marginal bristles, outer pair weaker.

Abdomen blackish, dusted brownish grey, rather short haired. Hypopygium dusted brownish grey.

Legs dark brown, first tarsal segment of front leg moderately swollen, otherwise legs slender. Mainly short haired, but middle and hind femora with slender anteroventral bristly hairs and hind tibiae with some longer posterodorsal bristly hairs. Front tibiae with weak antero- and posterodorsal preapical hairs.

Wings greyish with blackish veins. Stigma pale brownish. Vein 1A very faint. Halteres black.

♀. Similar to male, but front metatarsi simple and abdomen terminating in a pair of papillae.

Length 2·25 mm.

Holotype ♂. NEPAL: Taplejung District, between Sangu and Tamrang, wet boulder permanently shaded in deep river gorge, *c*. 5,200′, 14.ii.1962 (*R. L. Coe*).

Paratypes: 17 ♂, 5 ♀, same data as Holotype.

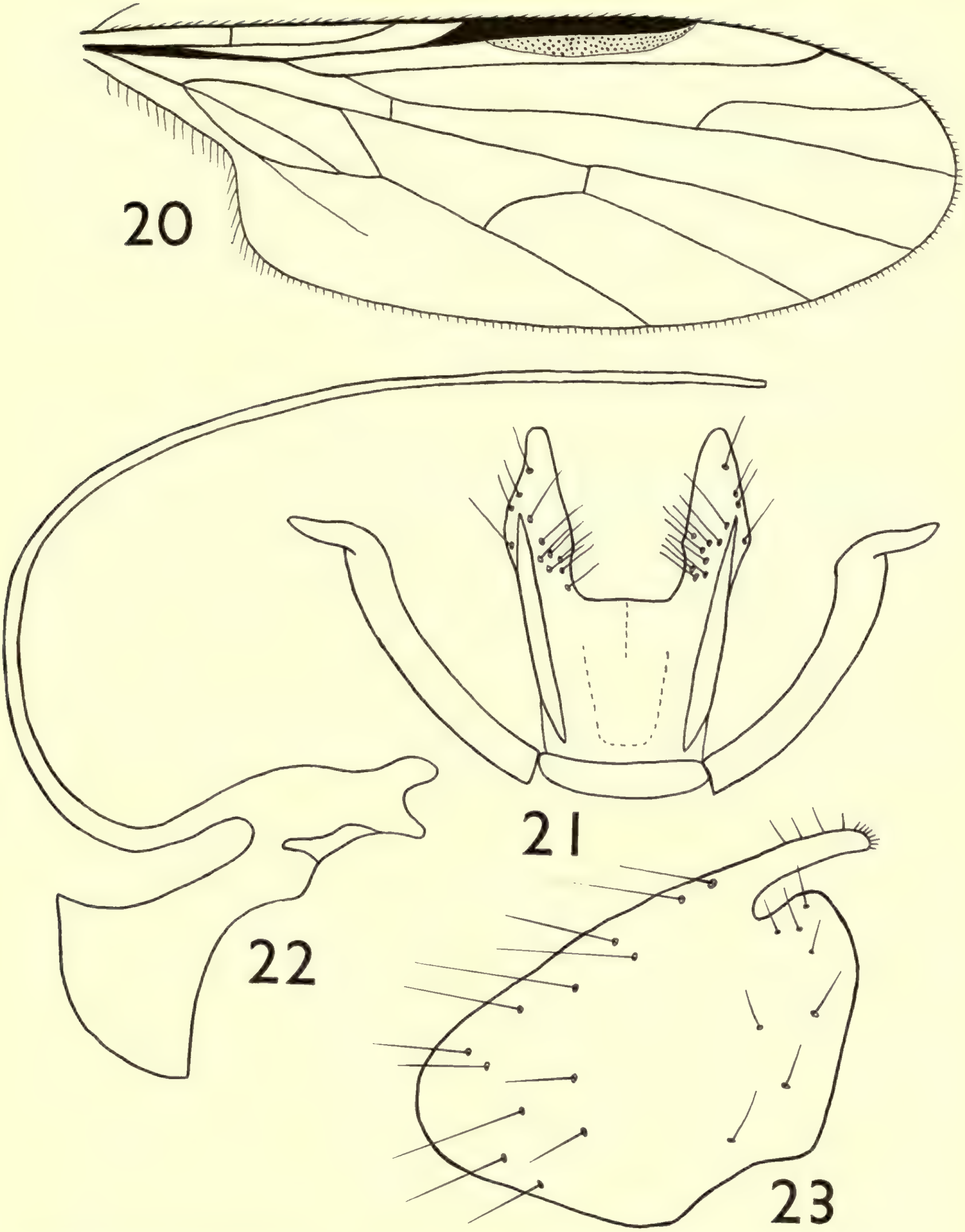
The specific name is a Nepalese word meaning "wet".

## *Hilara bhiga* sp. n.

(Text-figs. 24–27)

♂. Head black, heavily dusted brownish grey. A pair of frontal bristles and a pair of widely divergent ocellar bristles. The longer upper postocular bristles are not strongly curved forward over eye margins as in *H. gila*. Antennae black and resembling *H. gila* in proportions. Palpi yellow with a long ventral bristle.

Thorax black, brownish dusted, but viewed from in front with a narrow black stripe on each side between acrostichals and dorsocentrals, a fairly long bristle on each side of prothoracic collar, a humeral, a posthumeral, a long intrahumeral and a strong notopleural with a shorter bristle in front and another behind. Acrostichals quadriserial, but a little irregular; dorsocentrals uniserial ending in a longer prescutellar bristle. A supra-alar and a long postalar present. Pleurae heavily dusted brownish grey. Scutellum dusted brownish grey with 4 marginal bristles, outer pair weaker.



FIGS. 20–23. *Hilara gila* sp. n. 20, wing ; 21, epandrium and cerci (anterior view) ; 22, aedeagus ; 23, basistylus.

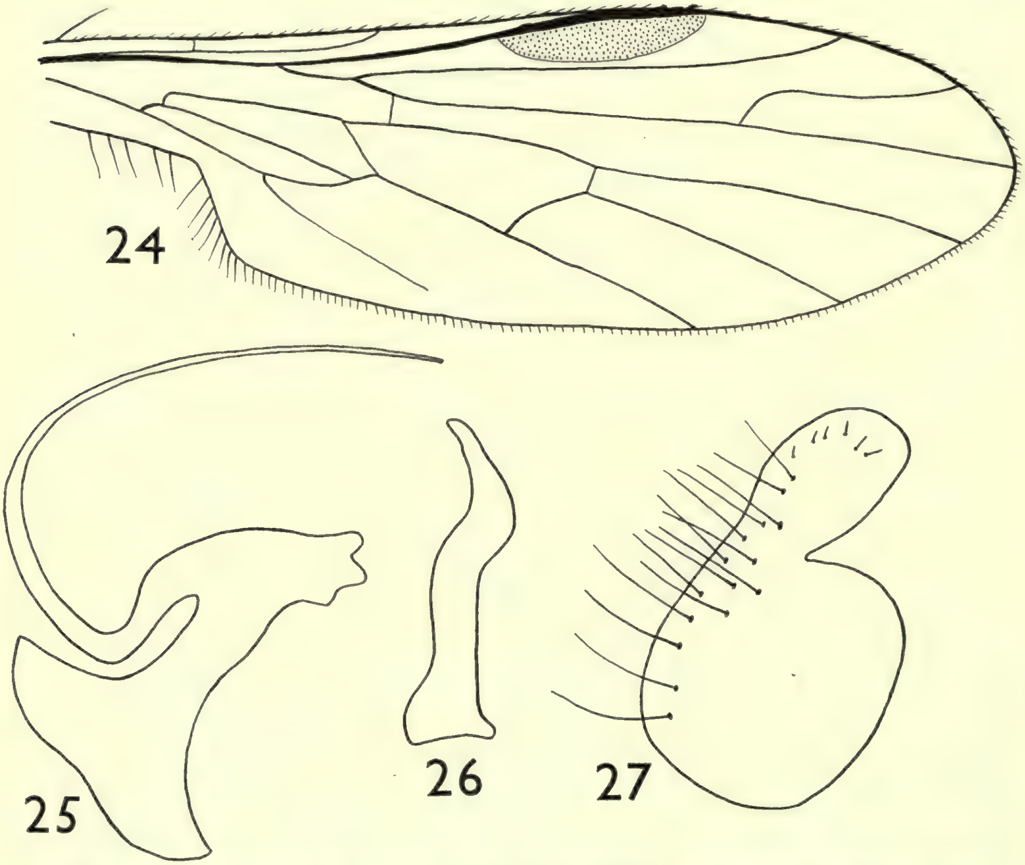
Abdomen black, dusted brownish grey, rather short haired, but with longer bristly hairs on hind margins of segments. Hypopygium blackish, dusted brownish.

Legs slender, except for moderately swollen front metatarsus in male ; front coxae yellowish brown, middle and hind coxae brownish grey. Front and middle femora yellowish brown to brown, hind femora yellowish brown on basal third, blackish distally. Tibiae brownish, darker towards tip, rest of legs blackish. Front femora short haired with some longer bristly hairs posterodorsally ; middle femora with long slender anterodorsal bristles, a long slender ventral bristle near base and slender posteroventral bristles on distal half ; hind femora short haired with some longer anteroventral bristly hairs. Front tibiae with anterodorsal bristles and a circlet of preapical bristles ; middle tibiae with one or two anteroventral bristles and a posteroventral bristle just beyond middle ; hind tibiae with some spaced anterodorsal, anteroventral and posterodorsal bristles. Tarsi with one or two bristly hairs above towards tip on first and second segments.

Wings distinctly brownish tinged with an elongate dark brown stigma and dark veins. Vein 1A distinct almost to wing margin. Halteres black.

♀ ? unknown (see below).

Length 2·75–3 mm.



Figs. 24–27. *Hilara bhiga* sp. n. 24, wing ; 25, aedeagus ; 26, left cercus (anterior view) ; 27, basistylus.

Holotype ♂. NEPAL: Taplejung District, between Sangu and Tamrang, wet boulder permanently shaded in deep river gorge, *c.* 5,200′, 14.ii.1962 (*R. L. Coe*).

Paratypes: 2 ♂, same data as Holotype.

A female (same data) may belong to this species, but is not included in the type series; it has yellow legs and the hind tibiae are somewhat swollen distally.

In Frey's (1952) key to East Asian Empididae this and the following species run to *H. fistulipes* Frey, but that species has black palpi.

The specific name is another Nepalese word meaning "wet".

### ***Hilara khola* sp. n.**

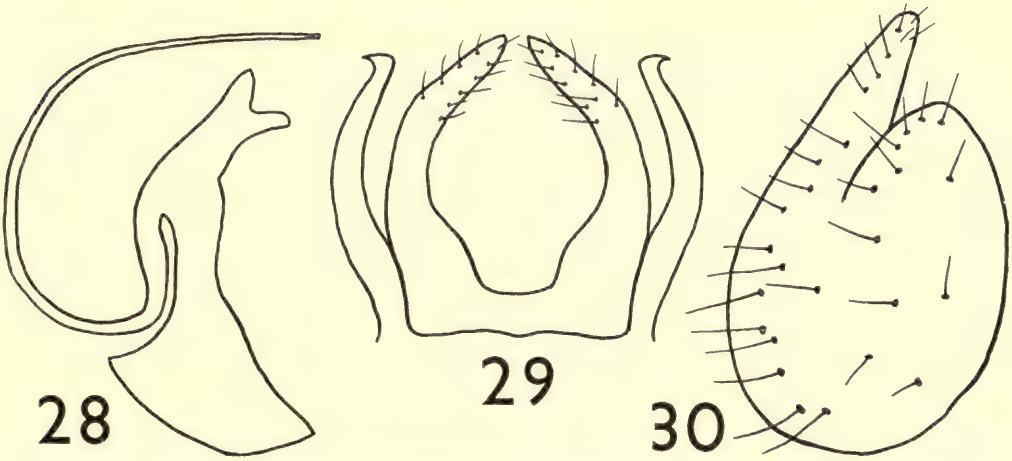
(Text-figs. 28–30)

♂. Head blackish, dusted greyish. Chaetotaxy as in the previous two species, but as in *H. bhiga* the postocular occipital bristly hairs do not curve forward over eye margins. Antennae black. Palpi yellow with a long ventral bristle.

Thorax black, but heavily dusted brownish to greyish and, viewed from in front, with a narrow stripe on each side between the acrostichal and dorsocentral rows of bristles. Prothoracic collar with a distinct bristle on each side. A humeral, intrahumeral and posthumeral bristles present. Acrostichals quadriserial, dorsocentrals uniserial, about the same length as acrostichals but ending in a longer prescutellar bristle. A notopleural bristle with a shorter bristle in front but a bristle of almost equal length behind, a supra-alar and a postalar. Pleurae black but heavily dusted brownish. Scutellum completely brownish dusted and with 4 marginal bristles, outer pair weaker.

Abdomen blackish, heavily dusted dark grey with short black hairs and some longer lateral bristly hairs. Hypopygium dusted greyish.

Legs yellow with last 4 tarsal segments of all legs dark brown. Front metatarsus moderately swollen. Middle femora with distinct anterodorsal bristles; hind femora with weak anterodorsal and anteroventral bristles. Middle tibiae with a short anteroventral bristle at distal



FIGS. 28–30. *Hilara khola* sp. n. 28, aedeagus; 29, epandrium and cerci (anterior view); 30, basistylus.

three-quarters. Hind tibiae with some short anteroventral bristles and a weak posterodorsal at middle. Legs otherwise moderately short haired.

Wings clear with brown veins. Stigma faint, vein 1A faint. Halteres black.

♀ unknown.

Length 2 mm.

Holotype ♂. NEPAL: Taplejung District, Dobhan, *c.* 3,500′, shady places on shrubby slope above River Tamur, 21–27.i.1962 (*R. L. Coe*).

The specific name is a Nepalese word meaning " river ".

## HEMERODROMIINAE

### *Hemerodromia* Meigen

*Hemerodromia* Meigen, 1822, *Syst. Beschr.* **3** : 61.
*Microdromia* Bigot, 1857, *Annls Soc. ent. Fr.* **3** : 557, 563.

A genus of world-wide distribution. Brunetti (1913 : 33) described *H. dorsalis* from India (as *Chelipoda*) and four species are now described from Nepal.

KEY TO NEPALESE SPECIES OF *Hemerodromia*

1 Thorax completely reddish yellow. Scutellum yellow . . . . ***pila*** sp. n.
– Thorax mostly black. Scutellum entirely black . . . . . . 2
2 (1) Halteres with knobs black. Thorax completely black. Antennae yellow ***serpa*** sp. n.
– Halteres yellow Thorax partly reddish yellow. Antennae whitish . . . 3
3 (2) Pleurae and sides of metanotum reddish yellow . . . . ***chita*** sp. n.
– Thorax, including pleurae, black, except for reddish yellow patch over humeri ***lomri*** sp. n.

### *Hemerodromia chita* sp. n.

(Text-figs. 31, 32)

♂. Head black, dusted greyish, but silvery behind eyes on lower half. Frons slightly wider than third antennal segment is deep. Face linear about middle, widening beneath antennae and above mouth and with some white hairs. Occiput with pale bristly hairs, cheeks with close set silvery hairs. A weak pair of yellow ocellar bristles. Antennae whitish; third segment pointed, a little longer than first and second segments together and with distinct hairs above and below on distal half. Proboscis yellow. Palpi yellowish with pale hairs.

Thorax broadly black, lightly dusted on a median stripe which widens to width of scutellum posteriorly; reddish yellow laterally on prothoracic collar, over humeri and laterally to wing base, bristles pale. Acrostichal bristles very short, biserial; dorsocentrals minute, uniserial. A single distinct notopleural bristle with a row of about 6 bristly hairs below. Pleurae yellow and yellowish dusted. Scutellum black, yellowish dusted, with a pair of weak apical bristles.

Abdomen black distally, yellow ventrally with pregenital segment completely yellow. Hypopygium black, basistylus with some broad flattened bristles at tip.

Legs completely yellow. Front legs of usual Hemerodromiid type with elongate coxae and swollen femora. Front femora with a double row of black points below and a row each of brownish antero- and posteroventral bristles. Middle and hind femora slender and without outstanding bristles. Front tibiae with a row of ventral bristles and a strong ventral apical bristle. Legs otherwise simple, without outstanding bristles.

Wings clear, veins brownish. Section of costa between end of $R_{2+3}$ and end of upper branch of $R_{4+5}$ obviously longer than upper branch of $R_{4+5}$. A distinct stump of the lower section of *Cu* present (vein that would close cell *Cu* if present). Halteres yellow.

♀. Similar to male, but bristles on front femora a little longer and stronger.

Length 2·75 mm.

Holotype ♂. NEPAL : Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

Paratypes : 3 ♂, 2 ♀, same data as Holotype.

This species resembles Brunetti's (1913 : 33) description of *H. dorsalis* from the Western Himalayas, but the hypopygium is not large as in that species. *H. orientalis* Meijere has the thorax more extensively darkened.

The specific name means " leopard ".

## *Hemerodromia pila* sp. n.

(Text-figs. 33, 34)

♂. Head similar to *H. chita*, but only very lightly dusted and proboscis a little smaller and more slender.

Thorax reddish yellow. Acrostichals very short and biserial ; dorsocentrals only a little longer and uniserial. The only other distinct bristle is a weak notopleural. Scutellum yellow with 4 pairs of weak marginal hairs. Pleurae yellow.

Abdomen black dorsally, except for yellow pregenital sternites, yellow ventrally. Hypopygium black.

Legs completely yellow. The swollen front femora with antero- and posteroventral bristles and a double row of black points beneath. Front tibiae with a row of ventral bristles and a strong ventral apical bristle. Legs otherwise slender and short haired without outstanding bristles.

Wings clear, with yellow veins. Section of costa between end of $R_{2+3}$ and upper branch of $R_{4+5}$ only slightly longer than upper branch of $R_{4+5}$. No trace of lower section of *Cu*. Halteres yellow.

♀. Resembling male except for abdominal terminalia.

Length 2·75 mm.

Holotype ♂. NEPAL : Taplejung District, Dobhan, evergreen trees overhanging stream in deep gully, *c.* 3,500′, 30.i.1962 (*R. L. Coe*).

Paratype ♀, same data as Holotype.

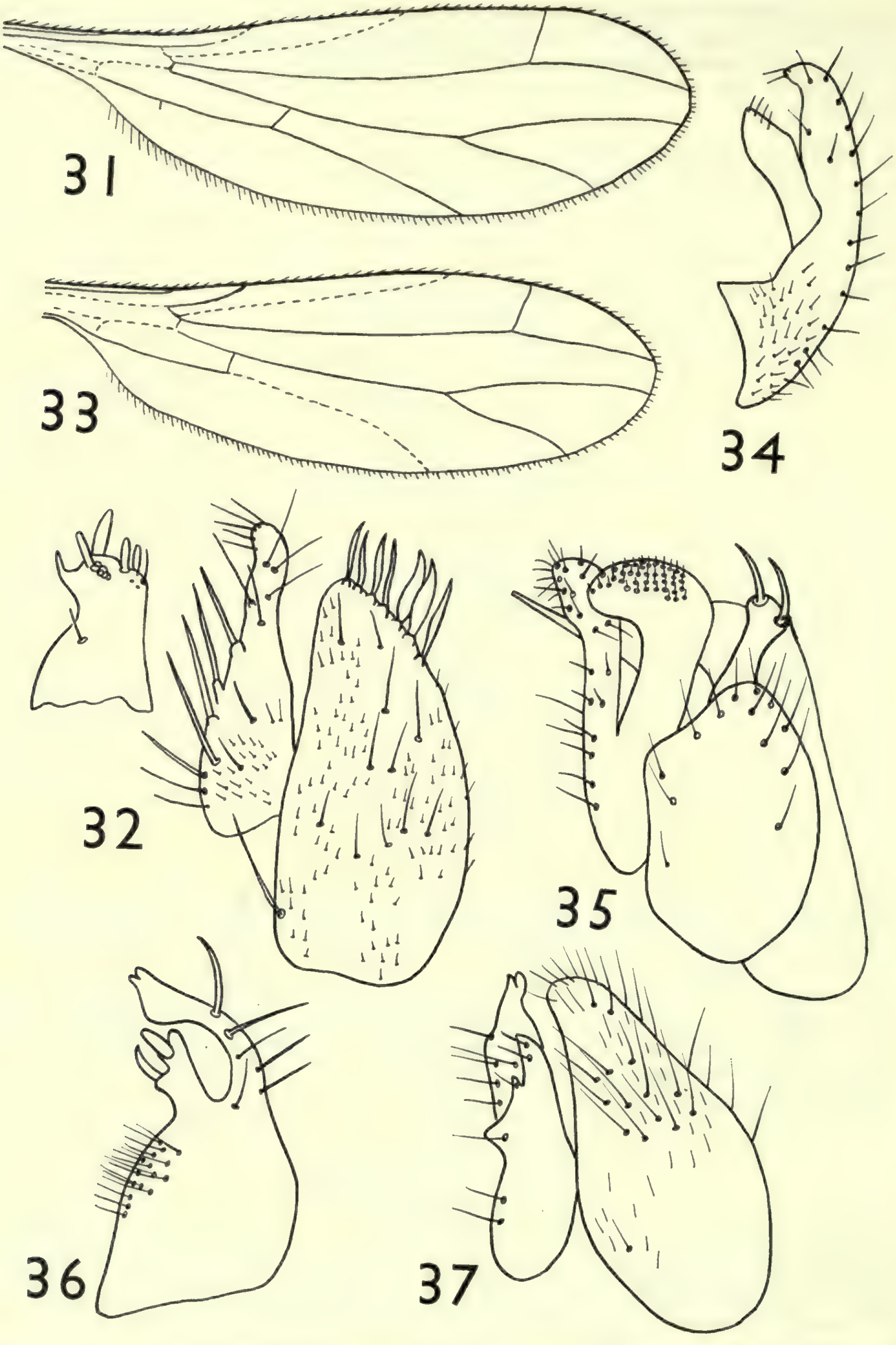
Very similar to the Palaearctic *H. oratoria* Fln. but thorax less heavily whitish dusted and thus more shining and differing from that species and Collin's (1941) allied species *H. bifurcata* and *H. acuminata* in structure of genitalia.

The specific name means " yellow ".

## *Hemerodromia serpa* sp. n.

(Text-fig. 35)

♂. Head black, brownish dusted, with face and lower half of head broadly silvery behind eyes. Frons twice ocellar width. Face linear at middle, the eyes very nearly touching for a short distance, with a row of hairs. A pair of weak ocellar bristles. Occiput short haired. Antennae yellow, third segment pointed. Proboscis yellow. Palpi short, pale yellow.



FIGS. 31–37. *Hemerodromia* spp. *H. chita* sp. n. 31, wing; 32, ♂ basistylus and epandrium; *H. pila* sp. n. 33, wing; 34 ♂ epandrium: *H. serpa* sp. n. 35, ♂ basistylus and epandrium: *H. lomri* sp. n. 36, ♂ epandrium; 37, ♂ basistylus and epandrium.

Thorax completely black, brownish dusted but subshining. Acrostichal bristles very short, biserial, dorsocentrals also very short, but uniserial. A weak notopleural bristle. Pleurae black, dusted brownish. Scutellum black, dulled by brownish dust and with 4 weak marginal hairs of which the apical pair are slightly longer.

Abdomen black, dulled by brownish dust. Hypopygium black, part of epandrium resembling a snake's head in shape.

Legs with front femora brownish, otherwise completely yellow. Chaetotaxy resembling *H. pila*, but bristles weaker.

Wings greyish, veins brown. Section of costa between end of $R_{2+3}$ and upper branch of $R_{4+5}$ only slightly longer than upper branch of $R_{4+5}$. No trace of the lower section of *Cu*. Halteres black, with extreme base of stem yellowish.

♀. Similar to male except for the abdomen, which is very slender apically, the last two segments being black and shining with the preceding segment whitish above and below, but shining black on a lateral stripe.

Length 2·25 mm.

Holotype ♂. NEPAL : Taplejung District, Dobhan, east bank of River Tamur, *c.* 3,500′, mixed vegetation by stream in deep gully, i–ii.1962 (*R. L. Coe*).

Paratypes : 3 ♂, 2 ♀, same data as Holotype ; Taplejung District, Dobhan, *c.* 3,500′, shady places on shrubby slope above R. Tamur, 21–27.i.1962, 2 ♂, 1 ♀ (*R. L. Coe*) ; Taplejung District, Dobhan, evergreen trees overhanging stream in deep gully, *c.* 3,500′, 30.i.1962, 2 ♂, 1 ♀ (*R. L. Coe*) ; Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962, 1 ♀ (*R. L. Coe*) ; Taplejung District, north of Sangu, dry grass above river bank, *c.* 5,200′, 5.i.1962, 1 ♂ (*R. L. Coe*) ; Taplejung District, between Sangu and Tamrang, mixed shrubs in deep gorge, *c.* 5,200′, x–xi.1961 2 ♀, (*R. L. Coe*) ; Arun Valley below Tumlingtar, River Sabhaya, west shore, *c.* 1,800′, evergreen shrubs on sandy shore, 9–17.xii.1961, 1 ♂ (*R. L. Coe*).

This species is very similar to *H. orientalis* Meijere (1911 : 330) from Java, but in that species the pleurae and venter are yellow, and the upper branch of $R_{4+5}$ is steeper. *H. xiphias* Bezzi (1914 : 74) from Formosa has the thorax, pleurae, venter and halteres black as in *H. serpa*, but differs from the male type in genital characters. Dr. Morge sent a male and two female syntypes and I have designated the male as lectotype.

The specific name means " snake ".

### *Hemerodromia lomri* sp. n.

(Text-figs. 36, 37)

♂. Head black, lightly brownish dusted and silvery behind eyes below. Frons twice ocellar width, but eyes touching for a short distance below antennae, so that the silvery face is divided into two small triangles. Ocellar bristles and occipital hairs longer than in the three preceding species. Antennae whitish, third segment pointed. Proboscis and palpi pale yellow.

Thorax, humeri and posterior calli yellowish, rest of thorax black, rather dulled by greyish dust. Acrostichals short and biserial, dorsocentrals short and uniserial. A distinct notopleural bristle with a few short bristly hairs in front. Pleurae black, but vaguely reddish around front and hind coxae. Scutellum black, completely dulled by greyish dust and with a pair of apical bristles.

Abdomen black, but pale yellowish at sides of first segment and first segment whitish below; short haired at sides, longer haired below especially on pregenital sternites. Hypopygium black.

Legs pale yellow, chaetotaxy similar to *H. serpa*.

Wings clear, veins brownish. Section of costa between end of $R_{2+3}$ and upper branch of $R_{4+5}$ obviously longer than the upper branch of $R_{4+5}$, which is slightly sinuous. No trace of the lower section of *Cu*. Halteres yellow.

♀. Similar to male, but abdomen whitish below on first three sternites. Anal papillae brownish.

Length 2·25 mm.

Holotype ♂. NEPAL: Taplejung District, Sangu, *c.* 6,200′, mixed vegetation below stream in gully, xi.1961–i.1962 (*R. L. Coe*).

Paratype ♀, Taplejung District, river banks below Tamrang Bridge, *c.* 5,500′, x–xi.1961 (*R. L. Coe*).

Similar to *H. orientalis* Meijere and *H. xiphias* Bezzi, but in both these species the halteres are black.

The specific name means " fox ".

## *CHELIPODA* Macquart

*Chelipoda* Macquart, 1823, *Mém. Soc. Sci. Lille*, **1819–22** : 148.

This genus is distinguished from *Phyllodromia* Zetterstedt only by the presence of the first $M_2$ cell. Melander (1927 : 263) regarded both as subgenera and, as Collin (1962 : 691) has pointed out, the presence or absence of one veinlet is of doubtful value at generic level (although similar cases occur elsewhere, e.g. *Empis* and *Rhamphomyia*). One female of *Chelipoda bakra* (described below) has this veinlet missing in both wings (Text-fig. 39), though the longitudinal veins are bowed in where the veinlet should be; in another female the veinlet is duplicated (Text-fig. 40). However I am for the present retaining both names at generic level since there appears to be some difference in the distribution of the two genera, *Chelipoda* occurring in Europe, N. and S. America, Formosa, Java, Australia and New Zealand, while *Phyllodromia* has only been correctly recorded from Europe and Formosa.

Brunetti (1920 : 368–9) described *Phyllodromia flavida* from India, but this has a 1st $M_2$ cell and thould be referred to *Chelipoda*. Bezzi's (1912, 1914) species should be reversed in their generic positions.

Two species are now described from Nepal.

### *Chelipoda bakra* sp. n.

(Text-figs. 38–41)

♂. Head black, rather heavily brownish dusted. Frons rather broad, but face linear. Ocellar bristles divergent, two pairs of vertical bristles and short hairs behind on lower half of head. Antennae blackish with long white terminal arista. Proboscis short, brownish; palpi very small, yellow.

Thorax black, dulled by brownish dust. A pair of microscopic acrostichal hairs at front of thorax. A strong pair of anterior dorsocentrals (almost intrahumeral in position), a pair of tiny median dorsocentral hairs and a weak pair of prescutellar dorsocentrals. A strong notopleural bristle with a very weak bristle in front and a strong supra-alar. Pleurae black, dusted brownish, metapleurae with a few bristles. Scutellum black, dusted brownish with a pair of weak apical bristles.

Abdomen black, dulled by brownish dust and short haired. Hypopygium large, black.

Legs yellowish with middle and hind femora and last tarsal segment of all legs brownish. Front coxae greatly elongated as is usual in this genus. Front femora swollen, with two rows of black points beneath and antero- and posteroventral bristles. Front tibiae " keeled " beneath. Legs otherwise slender and short-haired.

Wings clear with brown veins. Venation typical of the genus with 1st $M_2$ cell complete. Halteres dusky.

♀. Similar to male, but more robust, a little longer and abdomen terminating in a pair of yellow papillae.

Length 2·25 mm.

Holotype ♂. NEPAL: Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

Paratypes: 3 ♂ 4 ♀, same data as Holotype.

The specific name means " goat ".

## ***Chelipoda keta*** **sp. n.**

(Text-fig. 42)

♂. Head black, rather heavily dusted greyish. Ocellar bristles short, divergent. A pair of outer vertical bristles. Occiput with short pale hairs which become longer below. Antennae with first and third segments blackish, second segment yellow and arista whitish with extreme base darkened. Proboscis short, brownish, palpi small, yellowish.

Thorax black, dusted greyish on disc, but reddish brown laterally about humeri and wing bases. Chaetotaxy as in *C. bakra*. Scutellum dark brown with a pair of apical bristles. Pleurae reddish brown, metapleurae with two or three bristles.

Abdomen black, dusted brownish. Hypopygium pale.

Legs yellow except for blackish last two tarsal segments on all legs. Chaetotaxy as in *C. bakra*, but bristles on front femora a little stronger.

Wings clear with brown veins. Venation as in *C. bakra*. Halteres yellow.

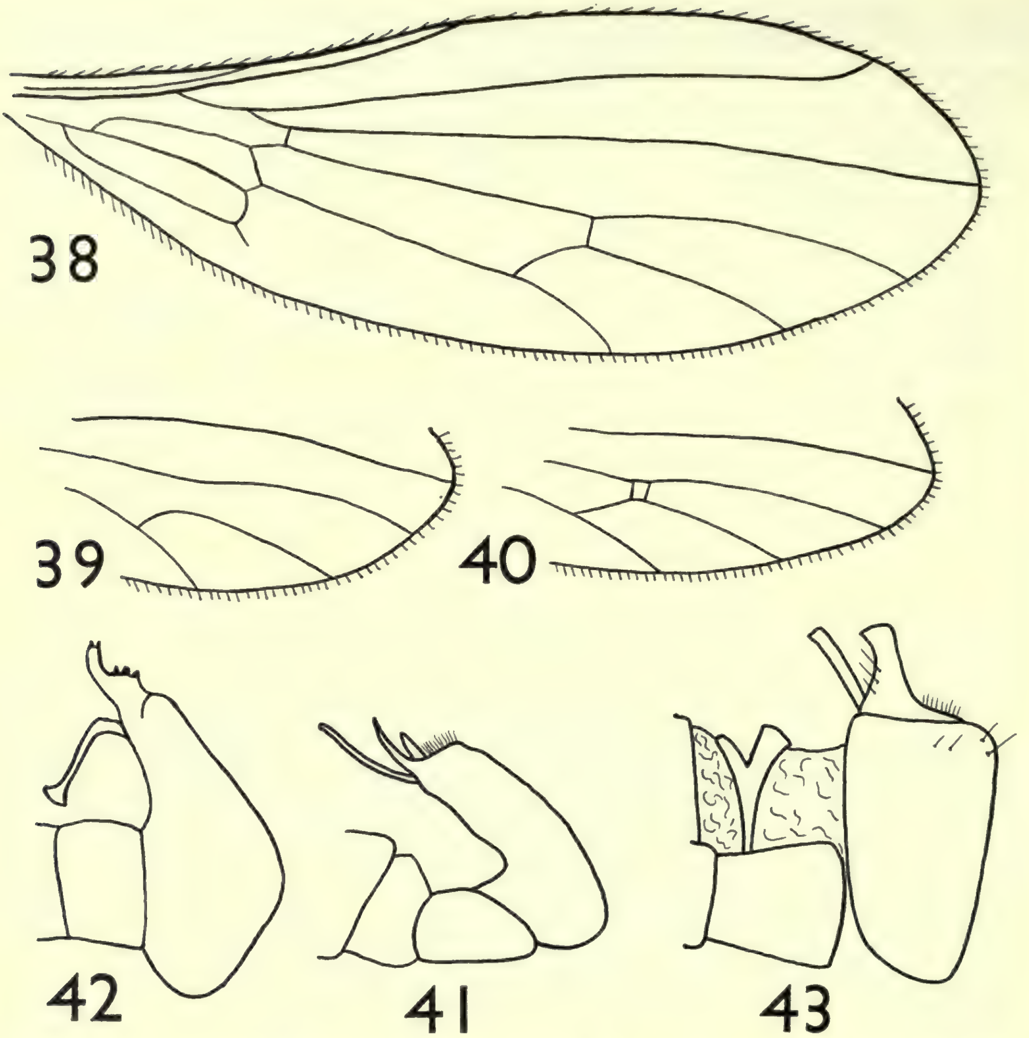
♀ unknown.

Length 2·25 mm.

Holotype ♂. NEPAL: Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

This and *C. bakra* resemble *C. fuscicornis* Bezzi (1912 : 478) from Formosa in having a white arista. The types of *C. fuscicornis* are not present in Sauter's collection at the Deutsches Entomologisches Institut, Berlin, but Dr. G. Petersen has kindly sent two males later recorded by Bezzi (1914 : 74). These specimens differ from the Nepalese species in having veins $R_{2+3}$ and $R_{4+5}$ distinctly bowed forward about the middle and in genital characters and the formation of the pregenital tergite (Text-fig. 43).

The specific name means " boy ".



FIGS. 38–43. *Chelipoda* spp. *C. bakra* sp. n. 38, wing; 39, 40, part of wing showing abnormal venation; 41, ♂ hypopygium: *C. keta* sp. n. 42, ♂ hypopygium: *C. fuscicornis* Bezzi. 43, ♂ hypopygium.

### ***Chelipoda*** sp.

A third new species resembling *C. keta* is represented by a headless male. I am reluctant to describe a species in this condition, but I have dissected the genitalia and these, with the specimen, are available for study by future workers.

NEPAL: Taplejung District, Sangu, *c.* 6,200′, mixed vegetation by stream in gully, xi.1961–i.1962, 1 ♂ (*R. L. Coe*).

## *HELEODROMIA* Haliday

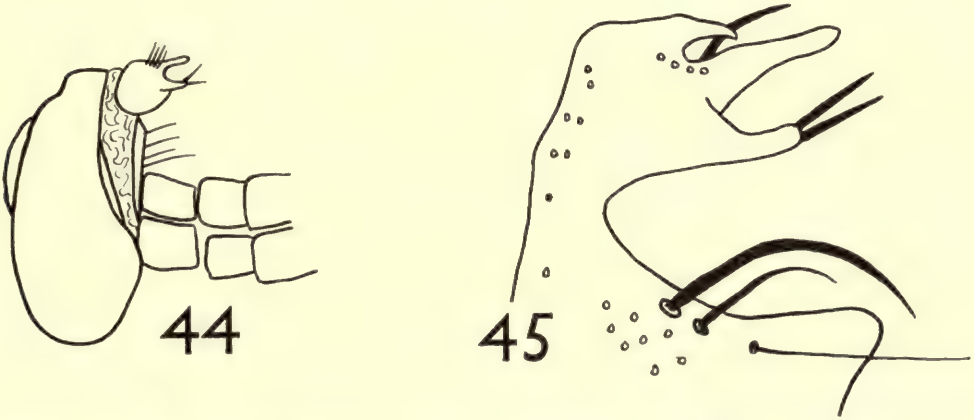
*Heleodromia* Haliday, 1833, *Ent. Mag.* **1** : 159.
*Sciodromia* Haliday *in* Westwood 1840, *Introd. Mod. Class. Ins.* **2** : 132.

This genus is represented by two species in Europe, one from North America and recently Saigusa (1963) has described four species from Japan. One species is now described from Nepal.

### *Heleodromia hilo* sp. n.

(Text-figs. 44, 45)

♂. Head olivaceous brown with the narrow face greyish. As usual with this genus, the " vertex " appears very large due to a flattening of the upper part of the occiput. Two pairs of bristles on each side of the flattened " vertex " with shorter postocular occipital bristles and some short fine hairs below. A pair of short but strong ocellar bristles present. Antennae short and black ; third segment short, ovate with a slender apical projection from which the long arista arises. Proboscis about as long as head is deep. Palpi black, short with a strong dorsal bristle towards tip.



FIGS. 44–45. *Heleodromia hilo* sp. n. 44, ♂ hypopygium ; 45, ♂, enlarged view of epandrium (some bristles missing but sockets shown).

Thorax (including pleurae and scutellum) dull olivaceous brown. No acrostichals, 4 pairs of dorsocentrals, the third pair weak. A weak humeral, a tiny posthumeral and a postalar present. Scutellum with a pair of crossing apical bristles.

Abdomen blackish with sparse pale hairs. Hypopygium black with longer pale hairs and some bristles distally.

Legs slender, brown, with last two tarsal segments of all legs blackish. Without strong bristles and short haired except for some long bristly hairs on basal half of front femora and similar shorter hairs on basal half of middle femora. The first tarsal segment is elongate on all legs and on the middle and hind legs is longer than the remaining tarsal segments.

Wings brownish tinged with venation typical of the genus. Halteres brownish.

♀ unknown.

Length 2 mm.

Holotype ♂. NEPAL : Taplejung District, between Sangu and Tamrang, *c.* 5,500′, mossy ground under bushes by hill stream, 20.x.1961 (*R. L. Coe*).

This species is browner than the European *H. immaculata* Haliday and the hypopygium is smaller. In Saigusa's key it runs to *H. boreoalpina* Saigusa, but that species has black legs and differs in genital characters. The North American species *H. pullata* (Melander, 1902 : 345) is a black insect with only the hypopygium olivaceous brown.

The specific name means " mud ".

## ***CHELIFERA*** Macquart

*Chelifera* Macquart, 1823, *Mém. Soc. Sci. Lille*, **1822** : 150.
*Mantipeza* Rondani, 1856, *Dipt. Ital. Prodr.* **1** : 148.
*Polydromia* Bigot, 1857, *Annls. Soc. ent. Fr.* (3) **5** : 562.

This genus is best known from the Palaearctic Region at present, but is recorded from North America and New Zealand ; Collin (1933 : 284) has described a somewhat atypical species from Chile.

One female was brought back from Nepal, but since species of *Chelifera* are not easily distinguishable in this sex I am reluctant to describe the species under a new name.

### ***Chelifera*** sp.

A black, greyish dusted species with antennae, palpi, venter, halteres and legs lemon-yellow. Wing stigma distinct. Halteres yellow. Length 3 mm.

NEPAL : Taplejung District, river banks below Tamrang bridge, *c.* 5,500′, x–xi. 1961, 1 ♀ (*R. L. Coe*).

## CLINOCERINAE

## ***DOLICHOCEPHALA*** Macquart

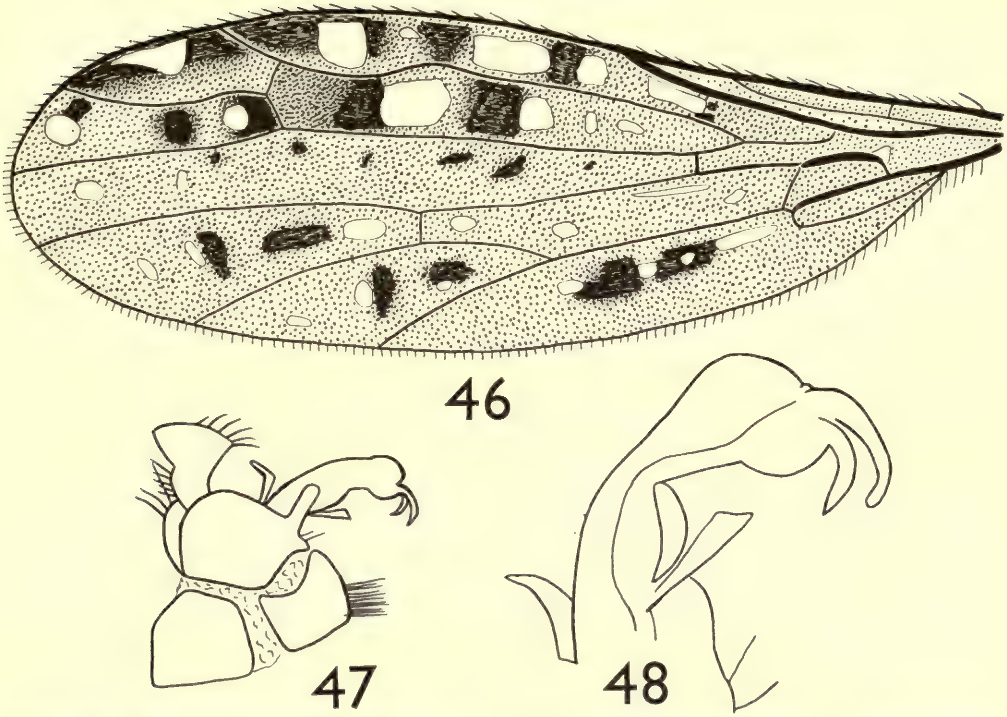
*Dolichocephala* Macquart, 1823, *Mém. Soc. Sci. Lille*, **1822** : 147.
*Ardoptera* Macquart, 1827, *Mém. Soc. Sci. Lille*, **1827** : 105.
*Leptosceles* Haliday, 1833, *Ent. Mag.* **1** : 160.

Three Palaearctic species of *Dolichocephala* are known and several species occur in Africa. Brunetti (1913 : 35 ; 1920 : 371) described *D. septemnotata* from Simla. Although the immature stages are unknown, they are probably aquatic since the adults are never found far from streams or lakes. One species is now described from Nepal.

### ***Dolichocephala flamingo*** **sp. n.**

(Text-figs. 46–48)

♂. Head brown, dusted greyish around neck and on face ; a pair of strong ocellar bristles and a weaker pair of vertical bristles. Postocular bristles strong above, becoming finer below. Antennae short, dull black, third segment rounded, shorter than first and second segments



Figs. 46–48. *Dolichocephala flamingo* sp. n. 46, wing ; 47, ♂ hypopygium ; 48, ♂ enlarged view of aedeagus.

together ; arista black, a little more than twice antennal length and downcurved in the manner characteristic of the genus.

Thorax brownish, dusted greyish on a median line. Acrostichal bristles absent, 5 pairs of dorsocentrals, a humeral, a posthumeral, a notopleural and a postalar present. Pleurae greyish dusted, metapleurae with a few hairs. Scutellum brown with a pair of upright parallel apical bristles.

Abdomen dark brownish, hypopygium with a tuft of bristly hairs on the sternal keel and the tip of the aedeagus rather suggestive of a flamingo's head in profile.

Legs yellowish brown, except for middle and hind coxae, which are greyish and all tibiae are darkened at tip. Legs extremely short haired and devoid of bristles.

Wings brownish with some darker patches especially on anterior half of wing and numerous hyaline spots ; vein $R_{2+3}$ undulating. Halteres yellow.

♀ unknown.

Length 2 mm.

Holotype ♂. Nepal : Arun Valley, east shore of River Arun below Tumlingtar, *c.* 1,800′, 14–23.xii.1961, evergreen shrubs bordering dry stream-beds (*R. L. Coe*).

This species resembles the Palaearctic *D. irrorata* Fallén in having hyaline spots along the costal vein. However the patterning of the wing is otherwise rather different and the genitalia are quite distinct.

## *HYPENELLA* Collin

*Hypenella* Collin, 1941, *Proc. R. ent. Soc. Lond.* (B) **10** : 239.

Collin (1941 : 239) erected the genus *Hypenella* to receive *H. empodiata* Collin from the Far Eastern border of the U.S.S.R. He distinguished the genus from *Clinocerella* Engel, which it most resembles, by the presence of fine vibrissae, hairy jowls, long triangular clypeus and the small palpi. Dr. T. Saigusa informs me (*in litt.*) that several species occur in Japan, but I have studied his manuscript figures and all are distinct from the Nepalese material. Two species are now described from Nepal which may be separated as follows :

| | | |
|---|---|---|
| 1 | Wings clear ; legs blackish . . . . . . | ***spumarius*** sp. n. |
| – | Wings brownish tinged ; femora yellow . . . . . . | ***bhura*** sp. n. |

### *Hypenella spumarius* sp. n.

(Text-figs. 49–51)

♂, ♀. Similar to *H. empodiata* Collin, but differing from Collin's description as follows : The facial hairs are weaker. The humerus and upper third to half of the mesopleuron is brownish. Prescutellar depression darker than thoracic disc but flanked by a greyish patch under the two posterior dorsocentrals. Hypopygium with the terminal process broadened towards tip. Hind tibiae with two or three short dorsal bristles just before tip. Wing stigma narrow and indistinct.

Length 2·5 mm.

Holotype ♂. NEPAL : Taplejung District, Dobhan, spray-splashed rocks in River Tamur, *c.* 3,300′, 3.ii.1962 (*R. L. Coe*).

Paratypes : 2 ♂, 5 ♀, same data as Holotype.

I have been unable to examine, or obtain information on, the type of *H. empodiata* Collin (in the Leningrad Museum) which is obviously very similar, but I prefer to regard this species as new rather than risk starting a chain of misidentifications by referring it erroneously to Collin's species.

### *Hypenella bhura* sp. n.

(Text-fig. 52)

♂, ♀. Head similar to preceding species, but occiput black. Facial hairs much stronger more resembling *H. empodiata* Collin.

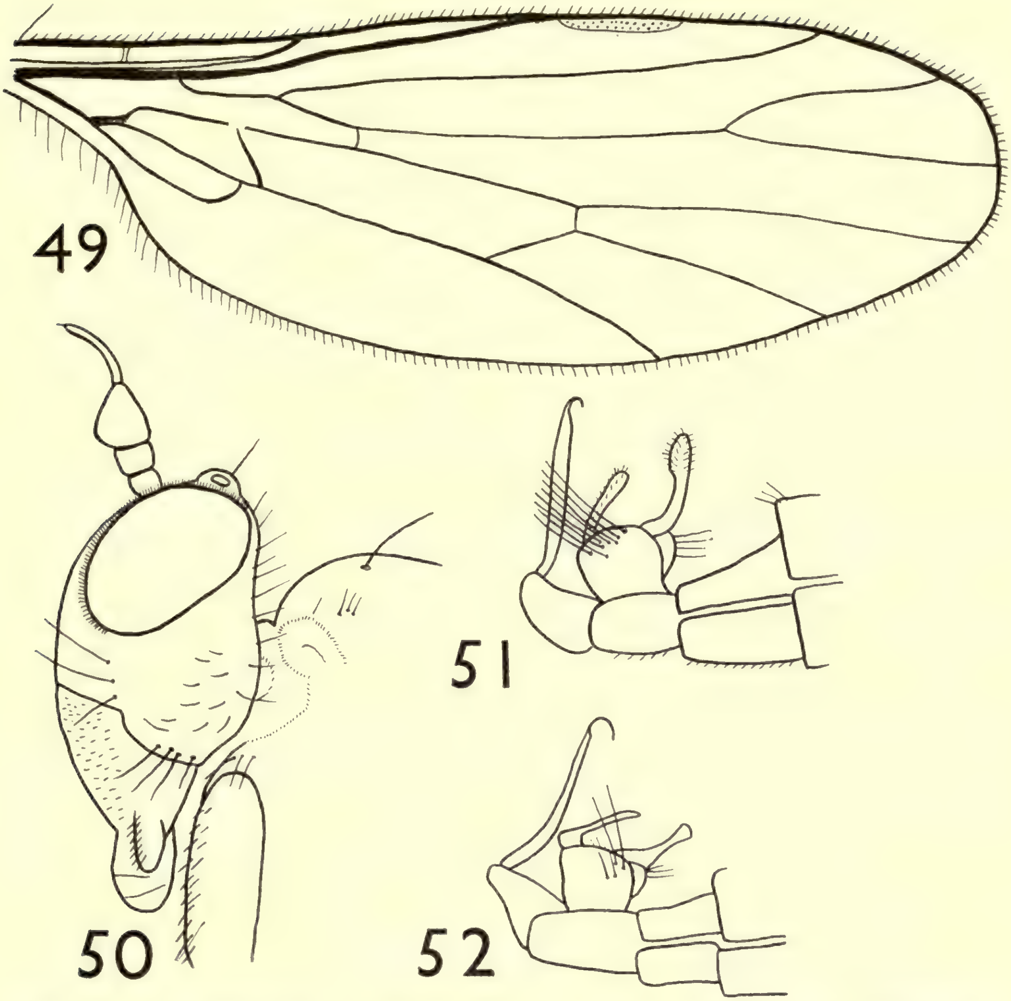
Thorax dark brown with paler mid-stripe ; darker on the prescutellar depression and without any pale areas under two posterior dorsocentrals, though paler on humeri and notopleurae. Under the high power of the binocular microscope, the thorax is clothed with dense microscopic pile. Chaetotaxy as in *H. spumarius*. Pleurae greyish. Scutellum dark brown and with two long apical bristles.

Abdomen olivaceous brown, greyish on disc. Venter more greyish. Hypopygium brownish.

Legs coxae and femora yellow, remainder blackish. Without outstanding bristles except for a " comb " of 5 short dorsal bristles on distal quarter of hind tibiae.

Wings distinctly brownish tinged, without stigma. Venation similar to *H. spumarius*. Halteres yellowish.

Length 2·25 mm.



FIGS. 49–52. *Hypenella* spp. *H. spumarius* sp. n. 49, wing ; 50, head ; 51, ♂ hypopygium : *H. bhura* sp. n. 52, ♂ hypopygium.

Holotype ♂. NEPAL : Taplejung District, Dobhan, *c.* 3,500′, spray-splashed rocks in River Maewa, 25.i.1962 (*R. L. Coe*).

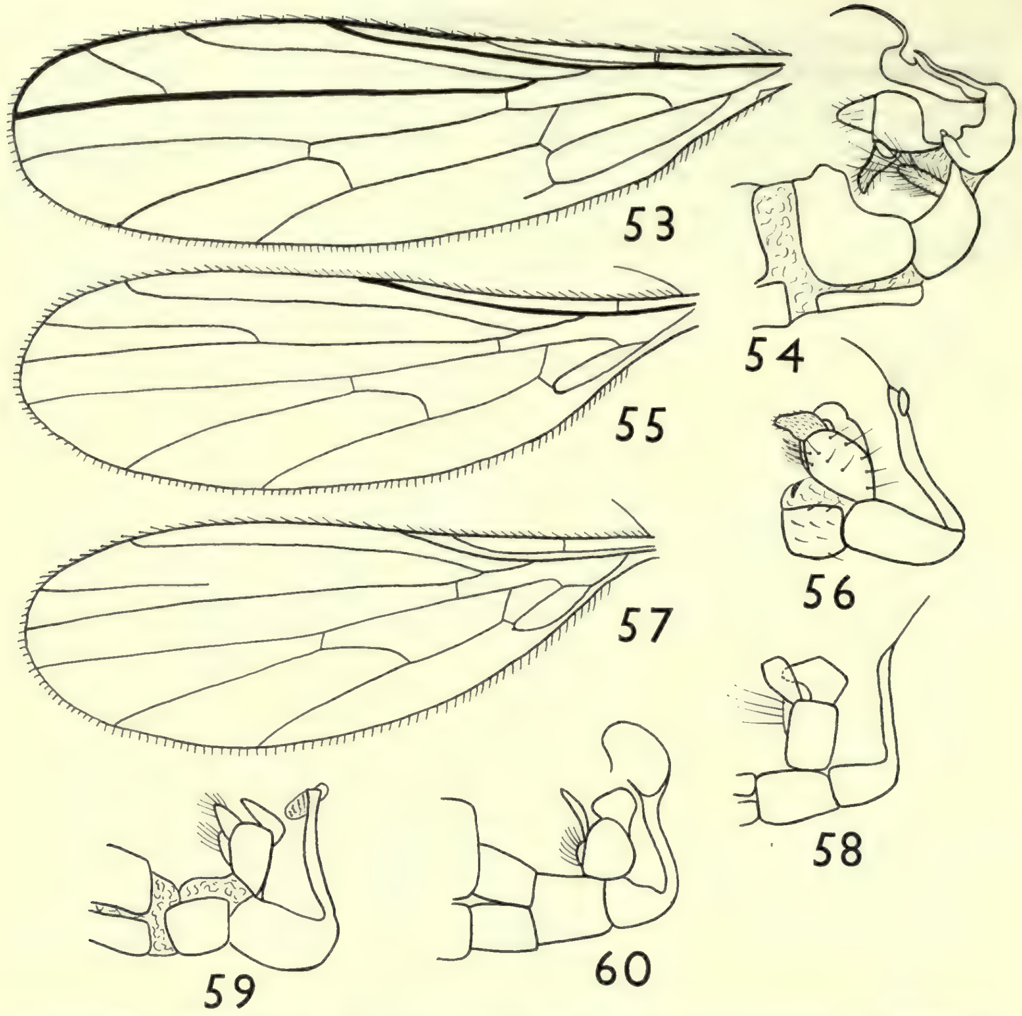
Paratype ♀, same data as Holotype.

The specific name is a Nepalese word meaning " brown ".

## *ACANTHOCLINOCERA* Saigusa

*Acanthoclinocera* Saigusa, 1965. *Kontyû*, **33** : 53.

Saigusa erected this genus for one species, *A. dasyscutellum* from Japan. A further species is now described from Nepal.



FIGS. 53–60. *Clinocera* spp. *C. evae* sp. n. 53, wing ; 54, ♂ hypopygium : *C. pani* sp. n. 55, wing ; 56, ♂ hypopygium : *C.* sp. 57, wing ; 58, ♂ hypopygium : *C. nadi* sp. n. 59, ♂ hypopygium : *C. chilamche* sp. n. 60, ♂ hypopygium.

## *Acanthoclinocera saigusai* sp. n.

(Text-figs. 61, 62)

♂. Head olive-brown with light grey postocular orbits and face. Ocellar bristles divergent. A single row of postocular occipital bristles and some long yellow bristly hairs below. Antennae black. Palpi dark brown with longish dark hairs.

Thorax dark olive-brown with a light grey patch on notopleurae and a light grey median stripe on prescutellar depression. A humeral and a posthumeral present. Two notopleural bristles, upper one stronger, and a postalar present. Five distinct pairs of dorsocentrals present and 3 pairs of tiny hairs between rows on the prescutellar depression, a line of three each side of the light grey prescutellar median stripe. Pleurae light grey except for a narrow brown band below notopleural suture. Metapleurae with a few slender pale bristles. Scutellum olive-brown except for a median continuation of the pale grey prescutellar stripe at base, upon which are a few hairs. A pair of scutellar marginals present with a weak pair of hairs outside and a tiny pair of hairs inside.

Abdomen olive-brown above, light grey at sides and below. Short dark haired above and short pale haired below. Hypopygium brown.

Legs dark brown, except for grey coxae. Front femora somewhat thickened basally. Legs short haired except for a short, but distinct anteroventral bristle towards tip of front femora and a few short anterodorsal and posteroventral bristles towards tip of hind tibiae, and bristles beneath tarsi including a stronger one at base.

Wings clear, long and narrow. Cell 1st $M_2$ pointed with only two veins issuing from its end due to short stalk, to the fork of *M*. (This feature may be an aberration, but both wings are identical.) Halteres blackish.

Length 3 mm.

Holotype ♂. NEPAL: Taplejung District, Dobhan, *c.* 3,500′, spray-splashed rocks in River Maewa, 2, 5.i.1962 (*R. L. Coe*).

This species may be distinguished at once from the only other described species, *A. dasyscutellum* Saigusa, by the grey postocular orbits and the abbreviated grey prescutellar stripe.

## *TRICHOCLINOCERA* Collin

*Trichoclinocera* Collin, 1941, *Proc. R. ent. Soc. Lond.* (B), **10** : 237.

Collin (1941 : 237) erected this genus to receive *T. stackelbergi* Collin described from Tigrovaja on the Far Eastern border of the U.S.S.R. Collin also included the American *Clinocera dolicheretma* Melander (1902 : 241) and *Wiedemannia hamifera* Melander (1927 : 233) in *Trichoclinocera*, as he says that both have the subcostal vein setulose.

One new species is now described from Nepal.

### *Trichoclinocera maewa* sp. n.

♂. Head grey. Eyes quite widely separated above antennae ; face about twice width of an ocellus, with a dark median stripe. Eyes hairy. Ocellar triangle dark with two short divergent ocellar bristles. Occiput with some short black bristly hairs above and long pale hairs below. Antennae black, third segment about as long as first and second segments together ; arista black, about 1½ times antennal length. Proboscis short and black, palpi black, with short black hairs below.

Thorax dull brown on disc, but greyish behind humeri along notopleurae and in region of posterior calli. No acrostichal bristles ; 5 pairs of dorsocentrals ; a humeral ; a posthumeral ; two notopleurals, upper one stronger ; two supra-alars and a weak postalar. Pleurae greyish with a brownish patch below wing base and with a few short pale hairs on mesopleurae, sternopleurae, metapleurae and hypopleurae. Scutellum grey, somewhat brownish on disc with a pair of crossing apical bristles.

Abdomen slate-grey at sides, but more brownish above. Hypopygium grey.

Legs with coxae grey, otherwise brownish. Front femora slightly thickened and with short black bristly hairs below. Middle femora slender, short haired with short spaced posteroventral bristles and one or two similar posteroventral bristles, but only towards tip. Hind femora slender with one or two short antero- and posteroventral bristles towards tip. All tibiae short haired, but hind tibiae with one or two bristly hairs above and below near tip. Tarsi simple and short haired, hind metatarsi with a few very short spaced bristles below.

Wings long and clear; halteres brownish.

♀. Similar to male, but frons and face wider. Abdomen blunt at tip. Legs shorter haired, but front femora with some long pale bristly hairs posteroventrally.

Length 2·5 mm.

Holotype ♂. NEPAL: Taplejung District, Dobhan, *c.* 3,500′, spray-splashed rocks in River Maewa (*R. L. Coe*).

Paratype ♀, same data as Holotype.

Similar to *T. stackelbergi* Collin, but that species has wings with clouded crossveins, and a blunter cell 1st $M_2$; grey legs and seven pairs of dorsocentral bristles.

## *PROCLINOPYGA* Melander

*Proclinopyga* Melander, 1927, *Gen. Ins.* **185**: 220–221.

This genus was erected by Melander to receive 5 species and a variety from North America. Collin (1941: 241) described *P. pervaga* from the Far Eastern border of the U.S.S.R. and Saigusa (1963) has described two species and recorded *P. pervaga* Collin from Japan and notes that others occur there.

One species was found in Nepal, which is here treated as a subspecies of the Japanese *P. seticosta* Saigusa.

### *Proclinopyga seticosta occidentalis* subsp. n.

(Text-figs. 65, 66)

♂. Head brownish grey with face more greyish. A pair of long outcurved ocellar bristles with a pair of divergent hairs between and a further pair behind ocellar triangle. Two rows of occipital bristles, those above longer. Antennae black. Proboscis short, palpi black, thickened at tip and clothed with dark hairs.

Thorax brown, somewhat greyish on narrow median line, on humeri and at sides. Acrostichal bristles biserial and usually 6 uniserial dorsocentrals present, but sometimes 5–7 of varying strength. A humeral and long curved intrahumeral, 3 notopleurals in an oblique row, 3 supra-alars and a postalar present. Pleurae greyish brown, 2 or 3 weak metapleural bristles. Scutellum greyish brown with 4 marginal bristles, outer pair weak.

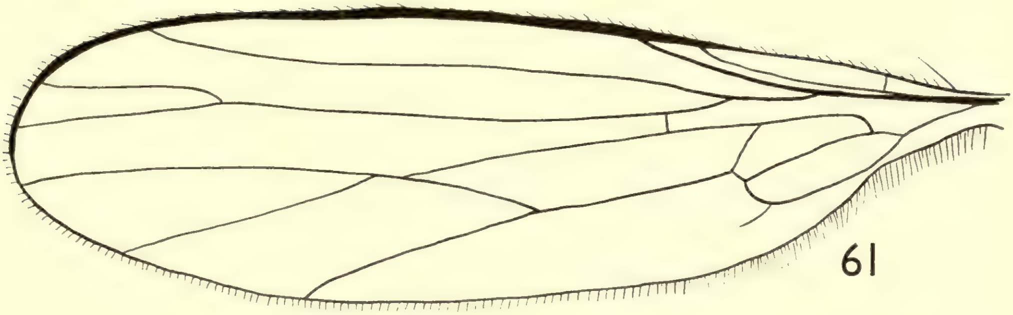
Abdomen greyish with short hairs below and longer above. Hypopygium blackish with aedeagus heavily sclerotized and shining.

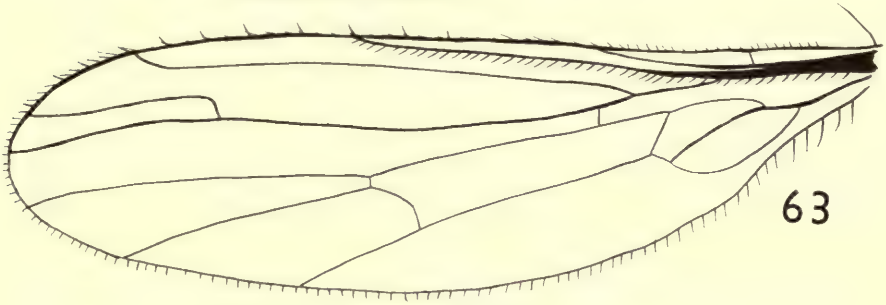
Legs black. Coxae with some pale bristly hairs in front. Front femora short haired except for one or two weak posterodorsal bristles. Middle femora with slender posteroventral bristles. Hind femora with weak anteroventral bristles, but fairly strong anterodorsals. Front tibiae with a weak but distinct anterodorsal and a similar posterodorsal in a pair near base, posteroventral bristly hairs longest. Hind tibiae with an anterodorsal bristle above near base. Tarsi slender.

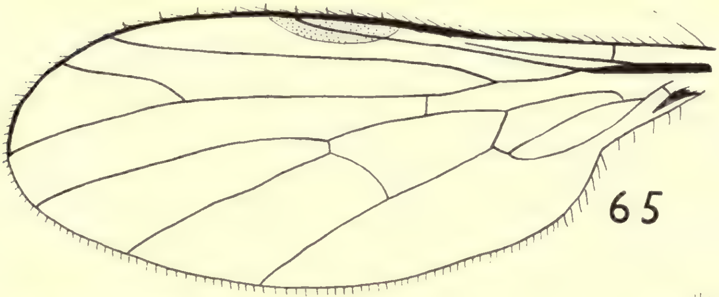
Wings brownish tinged with a faint stigma. Costa with distinct setulae from base of stigma to tip of vein $R_{2+3}$. Halteres dark brown.

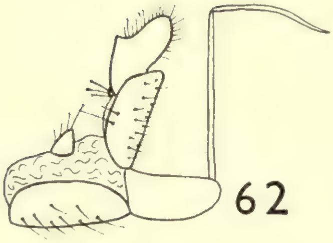
♀. Similar to male, but legs with much weaker bristles and hairs except for the anterodorsals on the hind femora.

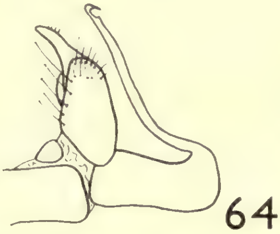
Length 2·5 mm.

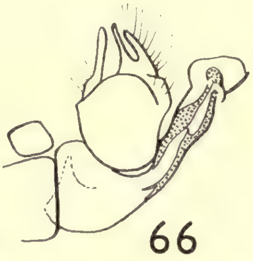












FIGS. 61–66. *Acanthoclinocera saigusai* sp. n. 61, wing; 62, ♂ hypopygium. *Trichoclinocera maewa* sp. n. 63, wing; 64, ♂ hypopygium. *Proclinopyga seticosta* Saigusa subsp. *occidentalis* subsp. n. 65, wing; 66. ♂ hypopygium.

Holotype ♂. NEPAL: Taplejung District, between Sangu and Tamrang, spray-splashed rocks in deep gorge, *c.* 5,200′, 1.i–14.ii.1962 (*R. L. Coe*).

Paratypes: 3 ♂, 3 ♀, same data as Holotype.

The subspecies differs from the typical form as follows: wings less strongly brownish tinged, hence making the stigma a little more distinct; the thorax is more greyish at sides and on the humeri and the scutellum is greyish; the legs are darker; coxae with some pale hairs below (all black in *P. seticosta*). The genitalia are very similar, but the anterior margin of the aedeagus is strongly sinuate.

Saigusa apparently included the intra-humerals in his range of 7–9 dorsocentrals.

These differences are slight, but consistent in the series studied and the two subspecies are certainly reproductively isolated, though they may prove to form part of a cline when material is available from intermediate territories. Meanwhile it seems advisable to give a subspecific name to the form described.

## *CLINOCERA* Meigen

*Clinocera* Meigen, 1803, in Illiger. *Mag. Ins.* **2** : 271.

Five species of *Clinocera* s. s. were collected by Mr. Coe.

### Key to Nepalese Species of *Clinocera*

1 Larger species with long (4 mm.) narrow wings and both sexes with short black antero- and posteroventral points beneath the brown front femora . . . ***evae*** sp. n.

– Smaller species with short (3 mm.) wings. Front femora of males with distinct antero- and posteroventral bristles (or, if with black points, then femora are yellow beneath) . . . . . . . . . . . . . 2

2 (1) Front femora yellowish for entire length beneath . . . . . . . . 3

– Front femora at most yellowish for short distance beneath towards tip . . 4

3 (2) ♂ with slender, pale antero- and posteroventral bristles on front femora . . Thoracic bristles strong . . . . . . . . ***chilamche*** sp. n.

– ♂ with short black antero- and posteroventral points which are restricted to middle third. Thoracic bristles weak . . . . . . . ***nadi*** sp. n.

4 (2) Front coxae yellowish . . . . . . . . . . . sp.

– Front coxae dark brown . . . . . . . . . . ***pani*** sp. n.

## *Clinocera evae* sp. n.

(Text-figs. 53, 54)

♂. Head brown with face grey. A pair of widely divergent ocellar bristles, two more or less distinct outer vertical bristles and a pair of postvertical bristles. A series of postocular occipital bristles above and pale hairs below. Antennae black. Palpi dark brown with some bristly hairs at tip.

Thorax brown with prothoracic collar, humeri and a small notopleural patch grey; viewed from above with a dark median stripe (which commences as two very narrow stripes which merge above middle of thorax) and two dark lateral patches, one behind humerus and one behind notopleural bristle. A humeral, notopleural, postalar and five pairs of dorsocentral bristles present. Pleurae grey. Prothoracic sternum with some long pale hairs at sides and metapleurae with about a dozen long pale bristly hairs. Scutellum brown with a pair of slender apical bristles.

Abdomen brown dorsally, grey laterally and ventrally, short haired. Hypopygium grey.

Legs dark brown. Front femora thickened, with some very short black anteroventral bristles on basal half, some stouter anteroventral black points on distal half; long pale posteroventral bristles on basal two-thirds and some stout black points on distal third. Middle femora slender with slender anterior bristles along entire length. Hind femora slender with short anterodorsal bristles. All tibiae slender, front tibiae ciliate beneath, otherwise with no outstanding bristles. Tarsi slender.

Wings faintly brownish tinged, with brown veins. Halteres brown.

♀. Similar to male, but front femora not so thickened, without the tiny basal anteroventral bristles and with the pale posteroventral bristles weak.

Length 3 mm.

Holotype ♂. NEPAL: Taplejung District, Dobhan, *c.* 3,500′, spray-splashed rocks in River Maewa, 25.i.1962 (*R. L. Coe*).

Paratypes: 2 ♂, 2 ♀, same data as Holotype.

This species resembles *C. fluviatilis* Brunetti (1913 : 34, fig. 33) from India, but in that species the thorax is darker, the first $M_2$ cell less pointed distally, cell $R_4$ is broader, and the genitalia quite different.

The species is named after my mother.

### *Clinocera chilamche* sp. n.

(Text-fig. 60)

♂. Head blackish, face dusted greyish. A pair of long ocellar bristles swept backwards. Occiput with a pair of outer vertical bristles, a row of postocular bristles and some short pale hairs below. Palpi short with bristly hairs at tip.

Thorax blackish, dusted brownish but subshining with humeri and notopleurae dusted greyish. A humeral, and a posthumeral; two notopleurals, upper one longer; a supra-alar and a postalar; five pairs of dorsocentrals. Pleurae blackish, dusted brownish. Metapleurae with about a dozen fine bristles. Scutellum concolorous with thorax and with two apical bristles.

Abdomen dark brownish, dusted brown, very sparsely short haired. Hypopygium blackish.

Legs with front coxae largely yellowish, all femora yellowish below, but otherwise legs brown. Front femora with weak pale antero- and posteroventral bristles. Front tibiae with some anterodorsal bristles hairy. Hind tibiae with some short bristles above and below distally.

Wings faintly brownish tinged, venation resembling the unnamed *Clinocera* sp. described below, but base of fork of $R_{4+5}$ complete. Halteres blackish.

♀. Similar to male, but bristles beneath front femora very weak.

Length 2·5 mm.

Holotype ♂. NEPAL: Taplejung District, Sangu, spray-splashed rocks in shallow ravine, *c.* 6,200′, 13.i.1962 (*R. L. Coe*).

Paratypes: 2 ♀, same data as Holotype.

Mr. Coe informs me that he has seen this species washed from one rock to another without being harmed.

Very similar to *C. megalatlantica* Vaillant (1956 : 65), but first $M_2$ cell more pointed, cell $R_4$ narrower and genitalia differing in the blunter broader surstylus and more slender aedeagus.

The specific name is a Nepalese word meaning " washing bowl ".

### *Clinocera pani* sp. n.

(Text-figs. 55, 56)

♂. Head dark olive-brown, with a pair of divergent ocellar bristles and a pair of distinct outer vertical bristles. Postocular bristles in a single row with some longer pale hairs below. Antennae black. Palpi dark brown with very short hairs.

Thorax dark olive-brown with small greyish patches on humeri, notopleurae and posterior calli. Viewed from above the thorax looks blackish, with a broad dark brown median stripe drawn to a point anteriorly, and narrowly pale around all margins. Humeri somewhat reddish yellow on hind corner. A humeral and posthumeral bristles ; two notopleurals present, upper one stronger ; five pairs of dorsocentrals ; a supra-alar and postalar. Pleurae greyish with a few bristles on metapleurae. Scutellum dark olive-brown with a pair of apical bristles.

Abdomen dark brownish grey with black hairs. Hypopygium black.

Legs dark brown with front femora yellowish at tip beneath and hind coxae somewhat yellowish behind. Front femora with short anteroventral bristles and slightly longer posteroventral bristles, short haired above. Middle femora almost bare below, short haired above but with some longer anterodorsal bristly hairs. Hind femora weakly haired below, short haired above. Tibiae and tarsi slender without outstanding bristles.

Wings grey with brown veins ; halteres black with yellow base.

♀. Similar to male, but front femora without bristles beneath.

Length 3 mm.

Holotype ♂. NEPAL : Taplejung District, Dobhan, *c.* 3,500′, spray-splashed rocks in River Maewa, 25.i.1962 (*R. L. Coe*).

Paratypes : 9 ♂, 5 ♀, same data as Holotype.

In structure of the male genitalia this species resembles *Clinocera rufipes* Bezzi as figured by Vaillant (1960 : 177, pl. 2, figs. c–f). Bezzi (1899 : 147) described this as a variety of *C. nigra* Meigen and Collin (1960 : 743) treats it as " only a pale legged form of *C. nigra* " and states that this is " now generally accepted ". However Vaillant (*loc. cit.*) regards it as a distinct species and if the Russian species figured by him is in fact conspecific with Bezzi's type then he is justified. Although obviously very close, the leg coloration appears to distinguish *C. pani*.

The specific name is a Nepalese word meaning " rain ".

### *Clinocera nadi* sp. n.

(Text-fig. 59)

♂. Very similar to *C. chilamche*, but differing as follows :

Head and thorax heavily brownish dusted and completely dull. Thoracic bristles weaker, dorsocentrals weak, other bristles very weak. Abdomen greyish almost bare except for tiny hairs on hind margins of tergites and sternites. Hypopygium distinct. Antero- and posteroventral bristles beneath front femora short and spine-like, black and restricted to middle.

♀ unknown.

Holotype ♂. NEPAL : Taplejung District, Sangu, spray-splashed rocks in shallow ravine, *c.* 6,200′, 13.i.1962 (*R. L. Coe*).

The hypopygium of *C. nadi* strongly resemble Engel's (1931 : 487) figure of his *C. feuerborni* from Java, but that species has a small costal stigma.

The specific name is a Nepalese word meaning "river".

### *Clinocera* sp.

(Text-figs. 57, 58)

The venation of this specimen may be aberrant and while the genitalia are distinct I am reluctant to describe the species under a new name until further material is available.

Nepal : Taplejung District, between Sangu and Tamrang, spray-splashed rocks in deep gorge, *c.* 5,200′, 1–14.ii.1962, 1 ♂ (*R. L. Coe*).

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# AN INTRODUCTION TO THE ALEYRODIDAE OF WESTERN AFRICA (HOMOPTERA)

L. A. MOUND

BULLETIN OF
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ENTOMOLOGY Vol. 17 No. 3
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*By* L. A. MOUND

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## SYNOPSIS

The Aleyrodidae of Africa are very poorly known, only about fifty species being hitherto recorded from the entire continent. Forty species are here recognized from West Africa and the Congo, including thirteen new species, one new genus, three new synonyms, and three new combinations. Considerable variation is shown by some species, e.g. *Bemisia hancocki*, and this is correlated with the host leaf structure in some cases, e.g. *Pealius fici* and *Trialeurodes desmodii*. Reasons are given for considering that *Bemisia hancocki* is not a vector of Cassava Mosaic Virus, and that the spread of this disease and Cotton Leaf Curl was the result of the introduction of *B. tabaci*, the known vector, from India.

## INTRODUCTION

THE generic and specific classification of the sub-family Aleyrodinae of the Aleyrodidae is based entirely on the study of the so-called pupal cases, the exuviae of the fourth instar nymphs. Adults in this sub-family cannot as yet be placed in genera, although this is not true of the Aleurodicinae which are found mainly in the Neotropics. The absence of a systematic study of the adults is partly due to the failure of collectors to obtain adult whitefly along with their related pupal cases, but is also the result of the homogeneity of the adult structure in the Aleyrodinae. Although the adults show remarkably little variation, the nymphs exhibit a considerable range of structure, and a number of quite large genera can be clearly defined. However, the appearance of the pupal cases of several species is now known to vary, depending on the structure of the leaf of the host plant upon which the insect has developed (Russell, 1948; Hussey, 1957; Mound, 1963). This variation usually affects the dorsal setae, in that on hairy leaves these setae are long, but on glabrous leaves they are short. Other features are also affected, particularly the type of marginal crenulation, the form of the thoracic tracheal fold, and the overall shape and size of the body.

About fifty species of whitefly have until now been known from the continent of Africa, although more than seventy species have been recorded from Madagascar alone. That this is not a true faunal difference has become evident from collections made in the last few years in Nigeria, Kenya, and Sudan*. The family is clearly well represented throughout the continent, and this paper has been drawn up to indicate how inadequate is the available information on the occurrence of the species, to provide a means of recognizing the genera, and a basis from which further studies may be made. The magnification is indicated in the figures by a line 0·1 mm. in length. All the species recorded from West Africa and the Congo are referred to here, and if possible redescribed. The genera *Corbettia* and *Aleuropteridis* however are only treated briefly as they have recently been revised elsewhere. Thirteen new species and one new genus are described, with three new synonyms and three new combinations. Forty species are now recognizable from the area.

Unless stated to the contrary, the material used in this study is deposited in the British Museum (Natural History), and this incudes the type material of the African species described by both Corbett and Dozier. Most of the recent material has been collected by Dr. V. F. Eastop (*V. F. E.*), or the author (*L. A. M.*) and his assistants, E. A. James (*E. A. J.*) and M. O. Ezeigwe (*M. O. E.*). Dr. Eastop spent eighteen months on secondment from the British Museum to the West African Inter-Territorial Secretariat collecting aphids and whitefly, and the author was employed for eighteen months by the Federal Department of Agricultural Research, Nigeria. This paper is the outcome of work begun then at the request of the Director, Dr. J. M. Waterston, under the direction of the Principal Entomologist, Mr. F. A. Squire.

The author received collections, or assistance whilst collecting, from several workers in West African Departments of Agriculture; Mr. B. Beck and Mr. J. L. Gregory of the Federal Department, Nigeria; Mr. J. A'Brooke and Mr. G. Farley of North Nigeria; Mr. H. Caswell of the University of Ibadan; Mr. P. Rushton of Sierra Leone, and Dr. C. P. Hoyt of the South Pacific Commission. Dr. Charles Tao of Taipeh loaned a slide of paratypes of *Pealius longispinus* Tak., and G. R. Cunningham van Someren submitted several large collections from East Africa which have been important in defining certain species. The author wishes to express his gratitude to the Rockefeller Foundation for enabling him to visit the United States National Museum, Washington, and to Miss L. M. Russell of that Museum and Dr. V. F. Eastop of the British Museum (Natural History) for their frequent assistance.

## LIST OF SPECIES DISCUSSED

Synonyms are shown in italics, page references are given to disused combinations.

ACAUDALEYRODES
- africana (Dozier)
- citri (Priesner & Hosny)
  - *alhagi* (Priesner & Hosny)

AFRICALEURODES
- coffeacola Dozier
- loganiaceae Dozier
- ochnaceae Dozier
- vrijdaghii (Ghesquière)

ALEUROCANTHUS
- ?woglumi Ashby
- ?spiniferus (Quaintance)
  - ?*citricola* (Newstead)
- palmae Ghesquière (Cerataphis) (p. 124)
- regis sp. n.
- trispina sp. n.

ALEUROLOBUS
- hargreavesi Dozier
- onitshae sp. n.

---

*See also Cohic, F., *Cah., O.R.S.T.O.M.* (In press). [New species from Congo.]

ALEUROLONGA gen. n.
- cassiae sp. n.

ALEUROMARGINATUS
- tephrosiae Corbett

ALEUROPLATUS
- andropogoni Dozier
- fimbriae sp. n.
- periplocae (Dozier)

ALEUROPTERIDIS
- filicicola (Newstead)
  - *douglasi* Mound
- eastopi Mound
- hargreavesi Mound
- jamesi Mound

ALEUROTRACHELUS
- africanus Dozier (p. 119)

ALEUROTUBERCULATUS
- nigeriae sp. n.
- kusheriki sp. n.

ALEYRODES
- africana Newstead (p. 146)
- filicicola Newstead (p. 135)
- periplocae Dozier (p. 134)
- zimmermanni Newstead (p. 154)

BEMISIA
- tabaci (Gennadius)
  - *goldingi* Corbett
  - *nigeriensis* Corbett
  - *gossypiperda* Misra & Lamba
- hancocki Corbett

CORBETTIA
- milletiacola Dozier
- baphiae Russell
- indentata Russell
- grandis Russell
- graminis sp. n.

DIALEURODES
- kirkaldyi (Kotinsky)

DIALEUROLONGA
- africana (Newstead)
- hoyti sp. n.
- akureensis sp. n.
- emarginata sp. n.

NEOMASKELLIA
- bergii (Signoret)

PEALIUS
- fici sp. n.
- ezeigwi sp. n.

POGONALEYRODES
- zimmermanni (Newstead)

TETRALEURODES
- ghesquierei Dozier

TRIALEURODES
- desmodii Corbett
  - *lubia* El Khider & Khalifer
- hargreavesi Corbett
- ricini (Misra)

### Key to Genera

1 Lingula broader than long ; sub-margin with a series of setae ; on Gramineae and occasionally other Monocotyledons . . . . ***NEOMASKELLIA*** (p. 149)
– Lingula longer than broad . . . . . . . . . . . . 2
2 (1) True margin evenly reflexed ventrally, apparent margin with a series of setae ; on ferns . . . . . . . . . . ***ALEUROPTERIDIS*** (p. 135)
– True margin not reflexed evenly if at all . . . . . . . . 3
3 (2) Operculum fills much less than half of orifice ; black species ***ACAUDALEYRODES*** (p. 118)
– Operculum fills at least half of orifice . . . . . . . . . . 4
4 (3) Dorsal disc separated from sub-margin by suture-like fold . . . . . 5
– Dorsal disc not so separated from sub-margin . . . . . . . 8
5 (4) Sub-marginal folds parallel and longitudinal, not meeting at anterior . ***ALEUROLONGA*** (p. 130)
– Suture-like folds continuous around anterior sub-margin ; pupal case sub-circular to oval . . . . . . . . . . . . 6

6 (5) Pupal case clear or only weakly pigmented . . . ***AFRICALEURODES*** (p. 120)

– Pupal case black . . . 7

7 (6) Dorsal disc elevated by vertical sub-margin . . . ***TETRALEURODES*** (p. 155)

– Dorsal disc not elevated, small setae near sub-marginal fold ***ALEUROLOBUS*** (p. 126)

8 (4) Thoracic tracheal pores defined as distinct or indistinct pores, or strongly developed marginal teeth . . . 9

– Thoracic tracheal pores not apparent, or indicated by a few differentiated marginal crenulations . . . 12

9 (8) Margin or sub-margin with setae on distinct bases ; dorsal surface with characteristic circles of papillae . . . ***POGONALEYRODES*** (p. 154)

– No such marginal or sub-marginal setae . . . 10

10 (9) Caudal furrow broad, operculum conceals lingula ; first abdominal setae absent ; no setae associated with legs ; thoracic tracheal pore indistinct ; sub-margin with pores distal to a series of tubercles . ***ALEUROTUBERCULATUS*** (p. 136)

— Not as above . . . 11

11 (10) Vasiform orifice usually large, knobbed lingula exposed ; seventh abdominal segment shorter than sixth ; first abdominal setae present ; usually a stout spine at base of mesothoracic leg ; tracheal folds well developed ; sub-margin with a series of pores or papillae, if both then the pores are proximal of the papillae . . . ***DIALEUROLONGA*** (p. 146)

— Orifice usually small, lingula not exposed ; seventh abdominal segment equal in length to sixth ; legs without spines ; sub-margin without a series of papillae ***DIALEURODES*** (p. 144)

12 (8) No dorsal setae on first abdominal segment . . . 13

— Paired setae on first abdominal segment (This segment is not visible in *Trialeurodes hargreavesi*) . . . 14

13 (12) Lingula tip D-shaped ; orifice floor dissected by ridges ; sub-marginal setae conspicuous . . . ***PEALIUS*** (p. 150)

— Lingula and orifice floor otherwise ; sub-marginal setae inconspicuous or absent ***ALEUROPLATUS*** (p. 132)

14 (12) Less than four pairs of dorsal setae ; sub-margin with a series of pores or papillae ***TRIALEURODES*** (p. 155)

— More than four pairs of dorsal setae . . . 15

15 (14) Sub-dorsum with paired longitudinal rows of papillae ; sub-margin with sixteen pairs of setae . . . ***CORBETTIA*** (p. 143)

— Sub-dorsum and sub-margin otherwise . . . 16

16 (15) Vasiform orifice elongate triangular . . . ***BEMISIA*** (p. 140)

— Vasiform orifice otherwise . . . 17

17 (16) Dorsal setae small, inconspicuous, each marginal crenulation with a large pore ***ALEUROMARGINATUS*** (p. 131)

— Dorsal setae large, very conspicuous . . . ***ALEUROCANTHUS*** (p. 124)

## *ACAUDALEYRODES* Takahashi, 1951

Type-species : *Acaudaleyrodes pauliani* Tak., 1951.

Pupal-cases of whiteflies of the genus *Acaudaleyrodes* are easily recognized by the elongate vasiform orifice with a short transversely rectangular operculum. All the described species have been referred to as black with a white waxy marginal fringe. Two species are known from West Africa.

### ***Acaudaleyrodes africana*** (Dozier, 1934)

(Text-fig. 1)

*Aleurotrachelus africanus* Dozier, 1934.
*Acaudaleyrodes africana* (Dozier) Takahashi, 1951 : 382.

Pupal case : On lower surface of leaves ; dark brown or black ; white waxy fringe between one-tenth and one-fifth width of body ; probably some similar wax on dorsum. Length 0·60–0·75 mm. Breadth 0·45–0·55 mm.

Margin : Finely crenulate, twenty teeth in 0·1 mm., recurved ventrally, often difficult to observe. Apparent margin broadly crenulate, eight teeth in 0·1 mm. Anterior and posterior marginal setae present, apparently arising ventrally. Minute sub-marginal setae, 3 $\mu$ long, six pairs on cephalothorax and one pair on abdominal segments four to seven.

Dorsal surface : Setae on first abdominal segment minute, less than 3 $\mu$. Cephalic, eighth abdominal, and caudal setal bases large, the latter close to posterior margin. Sub-dorsum with simple pores, five pairs on cephalothorax, one pair on each of abdominal segments one and three to seven, just mesad of sub-marginal setae. Cephalic tubercle weakly developed, lateral to cephalic seta. Distinctive sub-marginal fold between cephalic tubercle and second abdominal segment. Cephalothorax keeled anteriorly. Transverse moulting suture anterior to thoracico-abdominal suture, curved deeply to posterior then recurved anteriorly. Abdominal segments one to six sub-equal in length, seven about two-thirds of six, eight about twice seven. Rhachis well developed, segmental sutures clear in sub-dorsum. Median tubercles not apparent. Length of vasiform orifice one and a half times breadth (0·06 × 0·04 mm.), floor with radiating lines of small tubercles. Operculum transverse, one-quarter the length of orifice. Lingula half length of orifice, sharply expanded apically, terminal setae curved.

Ventral surface : Thoracic tracheal folds poorly defined, posterior fold clear. No setae at base of legs. Many small papillae anterior to mouth parts. Abdominal segmentation clearly visible.

Material examined : Syntypes ; twenty pupal cases, CONGO : Barambu, on *Desmodium* sp., i.1926 (*J. Ghesquière*). Also ten pupal cases, NIGERIA : Ibadan, under leaf of herbaceous plant, i.1914 (*W. A. Lambourn*).

*A. africanus* can be distinguished from the other species in *Acaudaleyrodes* by the absence of setae from the base of the legs, the strongly expanded lingula tip, the finely crenulate recurved margin, and the conspicuous setal bases near the vasiform orifice.

### ***Acaudaleyrodes citri*** (Priesner & Hosny, 1934)

*Aleurotrachelus citri* Priesner & Hosny, 1934.
*Aleurotrachelus alhagi* Priesner & Hosny, 1934. **syn. n.**
*Acaudaleyrodes alhagi* (Priesner & Hosny) Russell, 1962. **syn. n.**
*Acaudaleyrodes citri* (Priesner & Hosny) Russell, 1962.

*A. alhagii* was distinguished from *A. citri* by the possession of a broader rhachis with a larger number of median tubercles. The present author has collected both of these forms abundantly on various Leguminous trees and shrubs along the Nile in Sudan and Egypt. The shape of the rhachis is highly variable within any one population, from narrow and trachea-like, forming a strong median ridge, to broad and rounded. This variation also exists in the syntype series. The broad rounded abdominal shape is commonly, although not solely, associated with the presence of an internal hymenopterous parasite.

*A. citri* differs from *A. africana* in the following characters : Margin strongly crenulate (eight teeth in 0·1 mm.), not recurved ventrally ; setal bases on dorsal surface not so large ; cephalic tubercles more pronounced ; median tubercles of rhachis occasionally in two or more rows ; lingula less expanded apically ; meso- and metathoracic legs each with a large conical seta near its base (0·1 mm. long).

Material examined : Numerous specimens from Egypt and Sudan, including abundant syntype material of both nominal species from that region at the Egyptian Department of Agriculture, Dokki, Cairo. Twelve pupal cases, SIERRA LEONE : Njala, on a leguminous weed, i.1927 (*E. Hargreaves*). Eight pupal cases, NIGERIA : Samaru, on unknown host, ix.1960 (*L. A. M.*).

Unfortunately, specimens of *A. pauliani*, the type-species described from Madagascar, and *A. rhachipora* (Singh) from India, are not available for study. Material of this genus from India and Pakistan in the British Museum collection cannot be distinguished from *A. citri*. Singh, however, indicated that the lingula of his species was not expanded apically, and so *A. rhachipora* should be easily recognized.

## *AFRICALEURODES* Dozier, 1934

Type-species : *Africaleurodes coffeacola* Dozier, 1934.

The genus *Africaleurodes* includes at present species in which the dorsal disc is distinctly separated from the sub-margin by an almost complete furrow. The transverse and longitudinal moulting sutures only reach to this furrow and there is a series of minute setae associated with the margin. It is thus closely related to *Aleurolobus*, from which it differs in the absence of dark pigmentation and the more complete occlusion of abdominal segment seven in the mid-line. The three species which are included may be separated on the following characters :

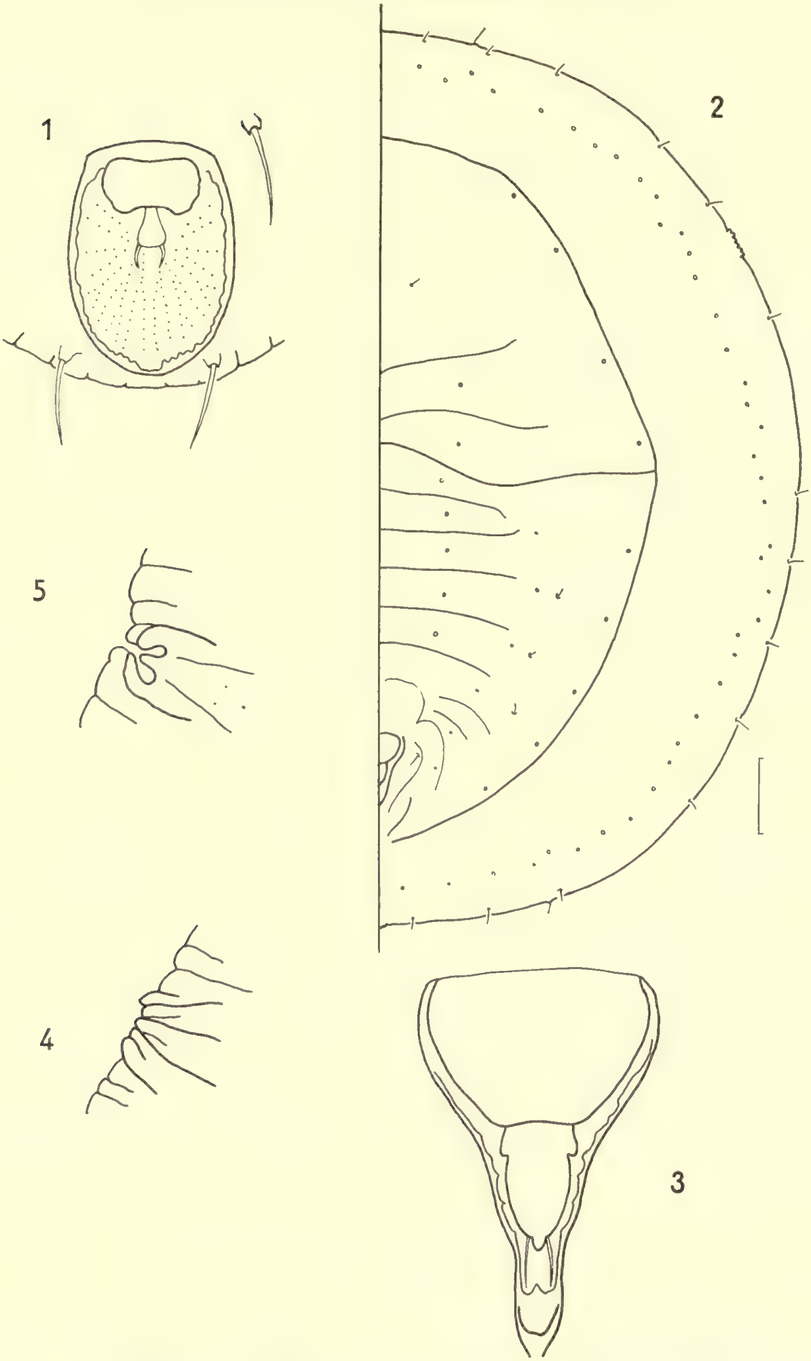
| | | |
|---|---|---|
| 1 | Vasiform orifice elongate-triangular . . . . . . . . | ***A. coffeacola*** |
| – | Vasiform orifice sub-cordate . . . . . . . . . . . . | 2 |
| 2 | Thoracic tracheal pore area a true pore . . . . . . . | ***A. loganiaceae*** |
| – | Thoracic tracheal pore area a comb of marginal teeth . . . . . | ***A. ochnaceae*** |

### *Africaleurodes coffeacola* Dozier, 1934

(Text-figs. 2 and 3)

Pupal case : White or very slightly brown, quite flat with no wax. Sub-circular in shape, widest across transverse moulting suture. Margin occasionally prominent in region of thoracic tracheal pores. Not infrequently on upper surface of leaves as well as lower. Female pupal cases probably larger than those of male. Length 1·0–1·5 mm. Breadth 0·9–1·25 mm.

Margin : Smoothly crenulate with faint anastomosing lines extending across sub-margin. Tracheal pores indicated by thickening, occasionally pigmentation, of six to eight marginal crenulations. Paired anterior and posterior marginal setae present (25 $\mu$ long). Very close to margin fourteen pairs of minute setae (10–15 $\mu$ long), seven pairs on both cephalothorax and abdomen including caudal setae. These setae frequently lost in mounting and staining. Sub-margin with irregular row of simple pores, these vary in diameter from 3 to 10 $\mu$ but are usually small.



FIGS. 1–5. 1. *Acaudaleyrodes africana*—vasiform orifice. 2–5. *Africaleurodes* spp. 2. *A. coffeacola*—pupal case. 3. *A. coffeacola*—vasiform orifice. 4. *A. ochnaceae*—thoracic tracheal pore. 5. *A. loganiaceae*—thoracic tracheal pore.

Dorsal disc : Separated from wide sub-margin by distinct furrow, only interrupted at caudal ridges. First abdominal segment apparently without setae, cephalic setae minute, those on eighth abdominal segment a little larger (5 $\mu$) very close to orifice. Abdominal segments four to six with a pair of sub-dorsal setae, rarely as long as 10 $\mu$, frequently appear to be absent. Three paired rows of segmental pores on both abdomen and cephalothorax ; on rhachis, subdorsum, and close to sub-marginal fold. Transverse moulting suture reaches sub-marginal fold, abdominal segmentation clear. Anterior margin of segment eight almost confluent with posterior margin of segment six. Abdominal segment seven thus often quite occluded in midline although well developed laterally. Subdorsal area sometimes reticulate. Caudal ridges well developed. Vasiform orifice elongate triangular (0·10 × 0·06 mm.) slightly constricted medially, posterior-lateral margins toothed, posterior narrowly open to caudal furrow. Lingula tip exposed, pyriform, with two tubercles proximally. Operculum subcordate, filling wide part of orifice.

Ventral surface : Posterior spiracles large with pair of long fine setae just anterior, anterior abdominal spiracles well developed. Tracheal folds clearly defined by many minute tubercles. Antennae do not extend beyond base of first leg in either sex. Meso- and metathoracic legs with minute basal seta.

Material examined : Syntypes ; two pupal cases, CONGO : Lodja, on *Coffea robusta*, iii.1928 (*J. Ghesquière*). Also about eighty pupal cases as follows : CAMEROONS : Bamenda, on Coffee and Cola, xi.1959 (*F. A. Squire*) ; NIGERIA : Ibadan, upper leaf surface of *Combretum brachteatum* and *Maesobotrya barteri*, vi.1956 (*V. F. E.*) ; Umudike, on *Allophylus africanus*, xi–1960 (*M. O. E.*). SIERRA LEONE : Freetown, on ? *Rubiaceae*, vii.1957 (*V. F. E.*). SUDAN : Yei, on Coffee, iv.1962, (*F. A. Mitwalli*) ; Wad Medani, on *Zizyphus spina-christi*, xii.1962 (*L. A. M.*). SEYCHELLES : Aldabra Island, on unknown host, 1916 (*P. R. Dupont*).

### ***Africaleurodes loganiaceae*** Dozier, 1934

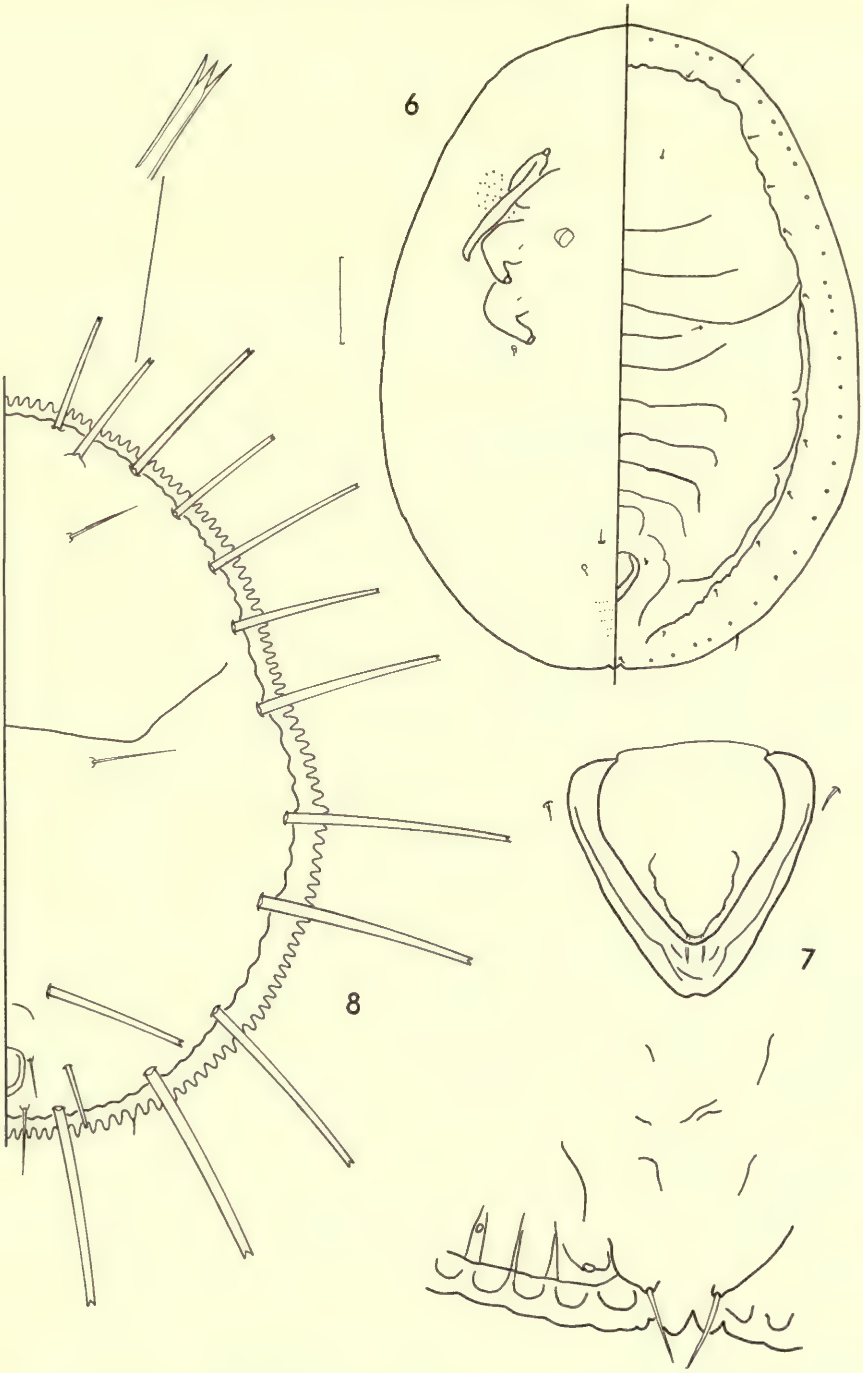
(Text-fig. 5)

Dozier distinguished this species from its congeners on account of its reddish-orange dorsal disc. There are three syntypes in the British Museum, collected by J. Ghesquière from Sankuru, Congo Republic, January, 1928, on a Loganiaceous plant. Fifteen specimens from *Microdesmis pulcrula*, at Ibadan, Nigeria, collected by E. O. James in January, 1961 may possibly be this species, although this material is colourless and the specimens considerably smaller than the syntypes. It is possible that *A. loganiaceae* can vary in structure in the same way that *A. coffeacola* has been shown to above. A definition of the species must therefore await the collection of further material. The syntype material, however, is fairly distinctive in that although the species is very similar to *A. coffeacola* in general appearance, the tracheal pores have two outer teeth converging around two shorter inner teeth, and the vasiform orifice is sub-cordate.

### ***Africaleurodes ochnaceae*** Dozier, 1934

(Text-fig. 4)

This species is even less well defined than *A. loganiaceae*. Syntype material in the British Museum consists of two and two half pupal cases from *Ochna*, at Kole, Congo Republic, collected by J. Ghesquière in January, 1928. The vasiform orifice is short



FIGS. 6–8. 6. *Aleurolobus onitshae*—pupal case (? male). 7. *A. onitshae*—vasiform orifice and caudal margin. 8. *Aleurocanthus regis*—pupal case and detail of seta.

and subcordate as in the previous species, but the tracheal pores are apparently represented by a comb of short teeth. This, however, is by no means certain, as the specimens are very poorly mounted.

### ***Africaleurodes vrijdaghii*** (Ghesquière, 1934)

*Aleurolobus vrijdaghii* Ghesquière, 1934.
*Africaleurodes vrijdaghii* (Ghesquière) Russell, 1962.

The only descriptive details given for this species are that the larva is " translucid and scarcely visible ", and in the accompanying photograph the vasiform orifice is almost completely obscured. The species was recorded as damaging coffee in the Congo.

## ***ALEUROCANTHUS*** Quaintance & Baker, 1914

Type-species : *Aleyrodes spiniferus* Quaintance, 1903.

The species included in the genus *Aleurocanthus* all bear on the dorsal surface of their pupal cases a number of long setae which are usually pointed. The two species described here as new are unusual in that in the first the setae have coronate tips, whilst in the second the sides of the setae are minutely spiny. Ghesquière (1934) records *A. woglumi* from Bomba in the Congo on Citrus, but there is some doubt about this record. It seems possible that the species actually found was *A. spiniferus* (*A. citricola* Newstead). He also describes as new *Aleurocanthus palmae*, but this is regarded by Risbec (1954) as a synonym of *Cerataphis lataniae*.

### ***Aleurocanthus regis*** **sp. n.**

(Text-fig. 8)

Pupal case : 1·0 × 0·8 mm. to 1·1 × 0·9 mm. Large, intensely black, on the lower surface of leaves. Has the appearance of a crown ; with a white waxy marginal fringe, a marginal ring of black setae each with a drop of golden fluid at its tip, and the centre of the dorsum occupied by rather greyish wax bearing the empty larval skins of earlier instars.

Margin : In mounted specimens apparently with two rows of crenulations. This is probably due to the dorsum being crushed down in the mounting procedure. In life the margin is vertical, elevating the dorsum from the ventral surface as in *Tetraleurodes* spp., and bearing vertical ridges. Twelve crenulations in 0·25 mm., each with a large pore. Anterior-marginal setae not seen, but posterior-marginals present. Thoracic tracheal pores not developed, but posterior pore indicated.

Dorsal surface : Flat, segmental sutures ill-defined. Seventh abdominal segment as long as fifth and sixth, eighth a little longer. Transverse moulting suture bends anteriorly, to mesothorax, not reaching margin. Caudal and cephalic setae finely pointed, similar setae on abdominal segments one and eight, these setae on distinct tubercles. Paired hollow setae with open coronate tips, apparently secretory, on abdominal segments seven and eight. Six pairs of similar setae on sub-margin of both abdomen and cephalothorax. All setae mounted on distinct tubercles. Four small papillae each with a wax gland, between each sub-marginal setal base. Vasiform orifice rather close to caudal margin, elongate rectangular, an internal projection at posterior margin. Operculum fills orifice, conceals broad spatulate lingula. Caudal furrow not developed.

Ventral surface : Anterior and posterior abdominal spiracles well developed, apparently connected with each other and with thoracic tracheal folds by a channel. Apparently two pairs of thoracic folds, opposite the two pairs of thoracic spiracles respectively. Posterior fold very short. All these folds indicated by many fine tubercles. Paired setae mesad of, and anterior to, posterior spiracles, also a minute seta at base of each meso and metathoracic leg. Antennae reach to first spiracle.

Holotype pupal case. NIGERIA : Ibadan, Moor Plantation, on *Combretum* sp., i.1961 (*L. A. M.*).

Paratypes, thirty-three pupal cases collected with the holotype.

Due to the extreme density of the black pigment this whitefly proved very difficult to mount and examine. However, the ring of sub-marginal coronate setae, and the absence of large setae from the dorsal disc are quite distinctive. Similar coronate setae had been described from the following species of *Aleurocanthus* ; *A. banksiae* (Maskell) ; *A. hirsutus* (Maskell) ; *A. rugosa* Singh ; *A. serratus* Qu. & B. ; *A. spinosus* (Kuwana). In life, the crown-like appearance is quite remarkable, with a drop of sparkling fluid at the tip of each long seta, and the white surrounding fringe of wax on the leaf.

## *Aleurocanthus trispina* sp. n.

(Text-figs. 9 and 10)

Pupal case : 0·7 × 0·4 mm. to 1·0 × 0·7 mm. On the lower surface of leaves, white or pale brown, with very long pale brown setae. Oval in shape, broadest across second abdominal segment, slightly keeled in mid-line.

Margin : With ten long teeth in 0·1 mm. Anterior and posterior marginal setae minute, on about the twelfth marginal tooth from mid-line. Tracheal pore areas not differentiated.

Dorsal surface : With thirty-four pairs of setae including long fine caudal setae which are sub-marginal. Abdomen with nineteen pairs of setae in three rows : on rhachis of segments one to six and eight ; on sub-margin of segments two to eight, also caudal setae ; an intermediate irregular row on segments three to six. Fifteen pairs of cephalo-thoracic setae arranged rather similarly : on sub-margin of pro- and mesothorax, with three in cephalic region ; medially on meso- and metathorax, and two pairs on cephalic segment ; an intermediate row on pro- meso, and meta-thorax with a group of three setae on cephalic region. The long setae all bear minute lateral spines. Segmental sutures weakly defined, transverse moulting suture deeply recurved around first abdominal segment, does not reach margin. Mesothoracic suture very clear, transverse. Seventh abdominal segment about as long as five and six. Vasiform orifice slightly elevated, elongate rectangular, with an internal posterior projection. Operculum cordate, nearly fills orifice concealing broadly spatulate lingula.

Ventral surface : Sub-margin with about four rows of rectangular markings, absent only at tracheal folds. Mesad of these markings are many raised dots, although the central part of the ventral surface is unsculptured. No setae associated with legs. Antennae bluntly pointed, reaching just posterior to first spiracle, rather longer and more slender than is usual.

Holotype pupal case. NIGERIA : Ibadan, Moor Plantation, on *Combretum micranthum*, xi.1959 (*E. A. J.*).

Paratypes ; five pupal cases with the same data as holotype ; also by the same collector at the same site, six pupal cases on an undetermined host, iii.1960, and four pupal cases on *Paullinia pinnata*, xi.1959.

This new species, with its very long barbed setae, is distinguished from all the others previously described in *Aleurocanthus* by the presence of a group of three pairs of long setae on the cephalic region close to the longitudinal moulting suture. Other species sometimes have a group of two pairs of setae on this position. It resembles *A. hansfordi* Corbett in the presence of sub-marginal ventral markings, but differs from that species in the above character and in the shape of the vasiform orifice. However, one of its host plants, *Paullinia pinnata* is recorded as the type-host of *A. hansfordi*.

## ***ALEUROLOBUS*** Quaintance & Baker, 1914

Type-species : *Aleyrodes marlatti* Qu., 1903.

The generic name refers to the trilobed figure formed by the eighth abdominal segment around the vasiform orifice. The orifice is usually cordate and completely filled by the operculum. The dorsal disc is separated from the sub-margin by a suture-like fold, and the sub-margin usually bears a series of setae.

### ***Aleurolobus hargreavesi*** Dozier, 1934

(Text-fig. 11)

This species differs from other described species of *Aleurolobus* in that the operculum is not pointed at the posterior margin, and the orifice itself is rather small. Although widespread it is not recognizable from the original description.

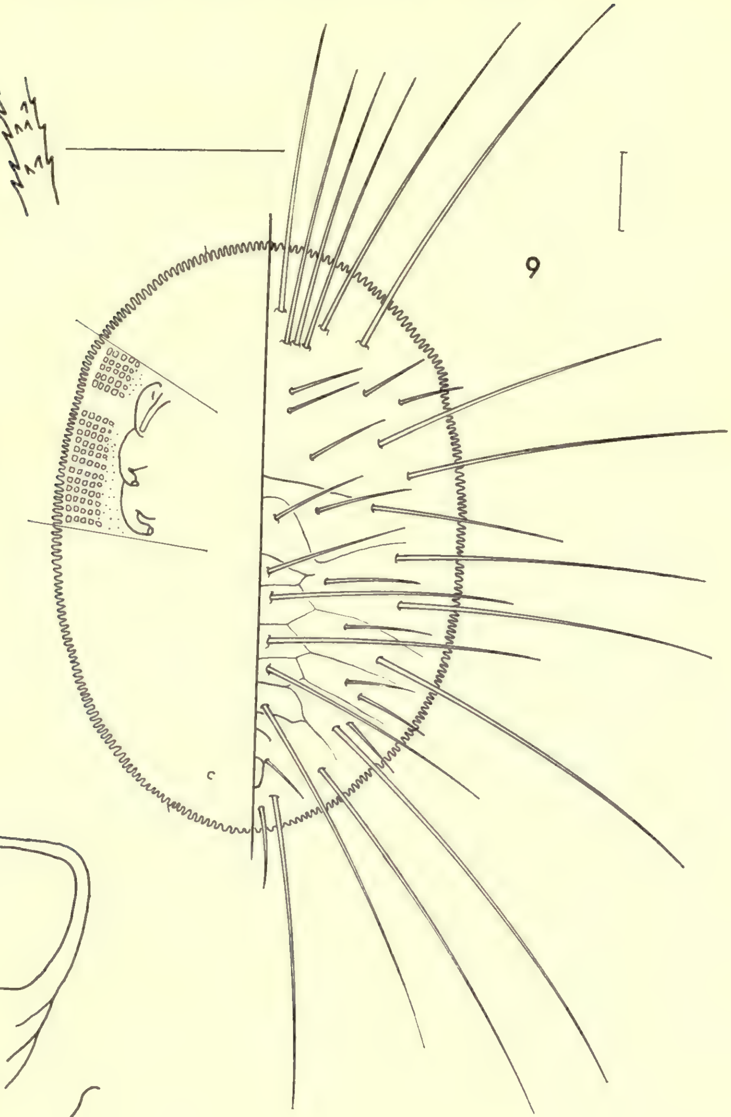
Pupal case : Females 1·8 × 1·0 mm. Males 1·2 × 0·7 mm. Black with a white waxy fringe, elongate oval in shape, broadest across first abdominal segment. On leaves of Graminaeae, parallel to leaf veins.

Margin : Crenulate with fine sutures across sub-margin. Tracheal pore areas not differentiated. Anterior and posterior marginal setae present. Sub-margin broad, one-quarter of overall width, separated from dorsal disc by suture-like fold. Sub-margin with fifteen pairs of setae, seven on cephalothorax and eight on abdomen. Setae vary in size and position, particularly in cephalic region where two pairs are frequently not apparent. Sub-margin with a series of simple pores.

Dorsal disc : Cephalic, first and eighth abdominal setae present. Mesothoracic suture marked, extending into subdorsal region, almost meeting transverse moulting suture which curves forward. Thoracico-abdominal suture bends posteriorly to meet short first abdominal segmental suture. Second abdominal suture curved to anterior, third and fourth sutures transverse. Seventh abdominal segment not very short medially, as is common in this genus, as long as segment two, three-quarters as long as six which equals eight. Paired submedian depressions present on each abdominal segment. Eighth abdominal segment not so clearly trilobed as in most members of this genus. Operculum cordate with transverse posterior margin, almost filling orifice. Lingula usually concealed, broadly spatulate with terminal pair of setae. Breadth of caudal furrow one-third its length, with transverse markings.

Ventral surface : Male antennae long, reaching to third leg, female antennae to second leg. Four pairs of spiracles well developed. Paired setae anterior to both rostrum and posterior abdominal spiracles. Meso- and metathoracic legs with a basal seta. These ventral setae rather long and fine.

Adult : (unexpanded specimens from Nigerian pupal cases). Darkly pigmented, wing span about 4 mm. Upper and lower parts of each eye not separated, joined by a narrow neck composed of two facets. Eye facets not different in size. Male abdominal glandular areas small,



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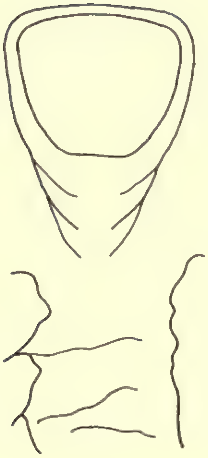

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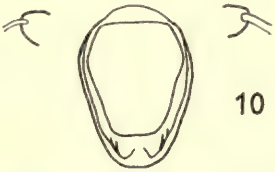

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FIGS. 9–11. 9. *Aleurocanthus trispina*—pupal case and detail of seta. 10. *A. trispina*—vasiform orifice. 11. *Aleurolobus hargreavesi*—vasiform orifice and caudal fold.

less than half length or width of their respective segments. Claspers with strong apical tooth, rounded medial lobe occupies one-quarter of inner length of clasper. Third antennal segment with large sub-apical rhinarium, seventh segment of female with conical rhinarium. Antennae long, seventh segment of male longer than that of female.

Material examined: Seven pupal cases (syntypes) and twenty recently mounted specimens from the original material, UGANDA: Kampala, on *Hyparrhenia* sp. (a grass), ii.1928 (*H. Hargreaves*). NIGERIA: Minna, on sugar cane, viii.1910 (*J. W. Scott-Macfie*), many specimens including two adult males and seven adult females; Samaru, on grass, x.1956 (*V. F. E.*), six pupal cases; Enugu, i.1957 (*V. F. E.*), twelve pupal cases.

### *Aleurolobus onitshae* sp. n.

(Text-figs. 6 and 7)

Pupal case: On lower surface of leaves, dark brown, with little wax. Oval in shape, broadest across second abdominal segment.

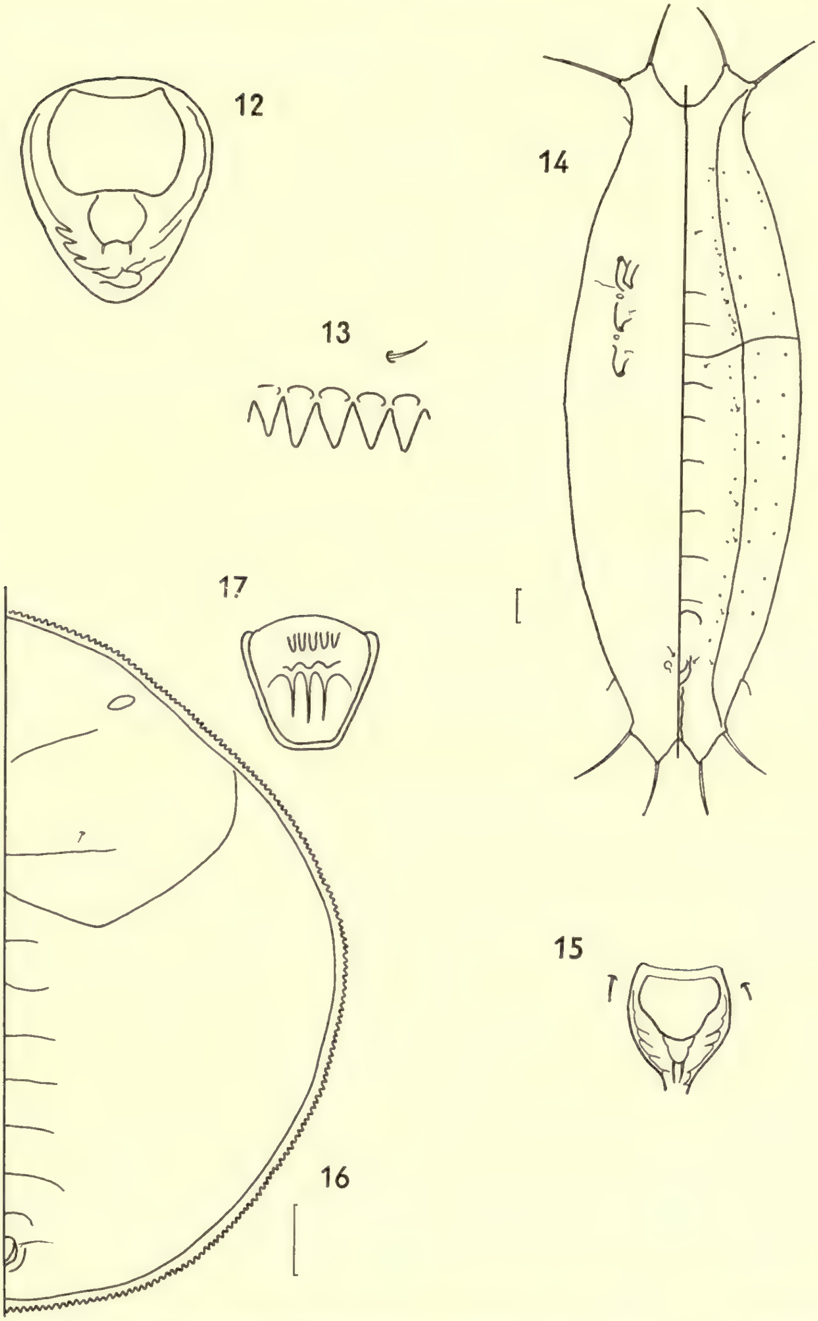
Margin: Crenulate, grooves run across sub-margin from broad and shallow crenulations. Paired anterior and posterior marginal setae present. Caudal setae on dorsal subterminal tubercles, small, barely extending beyond margin. Thoracic tracheal pore areas barely differentiated from margin, posterior pore with two teeth. Sub-margin with ring of small pores one-third of its width from margin, about one pore to every two or three crenulations. Dorsal disc separated from sub-margin by suture-like fold typical of this genus. Close to fold in sub-margin are ten pairs of small setae: on abdominal segments one and four to eight, on pro- and mesothorax and anteriorly and laterally in cephalic region. In one specimen, the fourth abdominal seta of one side is situated in the dorsal disc in the subdorsal region.

Dorsal disc: Abdomen with paired segmental pores, on rhachis, subdorsum and near sub-marginal fold. Similar pores on cephalothorax. Second abdominal suture bends sharply to anterior and meets first suture. Transverse moulting suture reaches sub-marginal fold, thoracico-abdominal fold not clear. Eighth abdominal segment forms trilobed figure typical of genus. Segment seven short, two-thirds of six, segment eight almost twice length of six. Small cephalic tubercles developed, lateral to these are so-called eyespots. Small paired setae on cephalic, first and eighth abdominal segments. Vasiform orifice typical of genus, triangular with floor dissected by ridges. Operculum pointed to posterior, nearly filling orifice, concealing knobbed lingula. Caudal furrow rather narrow.

Ventral surface: Thoracic tracheal folds defined by ridges and minute tubercles close to mesothoracic leg, but not near margin. Posterior fold defined by rows of elongate tubercles. Paired setae antero-mesad of posterior abdominal spiracles, also anterior to rostrum. A minute seta at base of each meso and metathoracic leg. Female antennae reach to anterior spiracle, male antennae stouter and extend beyond this. Adhesive sacs not heavily sclerotised.

Adult: Body darkly pigmented, wings with black markings. Third antennal segment with large rhinarium distally. Female antenna with segment seven shorter than total length of segments three, four, five and six. Male antenna with segment seven annulated and longer than total length of segments three, four, five and six. Dorsal and ventral portions of eyes almost completely separated by chitinous area bearing very many fine setae. Eye facets equal in size. Lingula only just exceeds vasiform orifice which is half filled by operculum. Male claspers simple with terminal tooth and sub-terminal fleshy lobe.

Holotype ♀ pupal case. NIGERIA: Onitsha, on *Phyllanthus floribundus*, i.1957, (*V.F.E.*).



Figs. 12–17. 12. *Aleuromarginatus tephrosiae*—vasiform orifice. 13. *A. tephrosiae*—caudal margin and seta. 14. *Aleurolonga cassiae*—pupal case. 15. *A. cassiae*—vasiform orifice. 16. *Aleuroplatus andropogoni*—pupal case. 17. *A. andropogoni*—vasiform orifice.

Paratypes, fifteen female and six male pupal cases, with the same data as the holotype, together with two female and three male adults dissected from these specimens. Also nine female and two male pupal cases, NIGERIA : Ibadan, on *Flueggea virosa*, i.1961 (*L. A. M.*).

This species is rather similar to *A. niloticus* Pr. & H., but differs from that and other described members of *Aleurolobus* in the absence of a well defined tracheal pore.

It is of some interest that the adults of these two species of *Aleurolobus* should both have sexually dimorphic antennae. This is also known to occur in the adults of the following members of the genus, *A. barodensis* (Maskell), *niloticus* Pr. & H., *olivinus* (Silvestri), *philippinensis* Qu. & B., and *simulus* (Peal). Many whitefly species have three sensoria at the distal end of the third antennal segment. In the adults of *A. barodensis*, *hargreavesi*, *niloticus* and *onitshae*, the only species available to the author, the least distal sensorium is developed into a large clear sensory plate which is reminiscent of the rhinaria of certain aphids.

## *ALEUROLONGA* gen. n.

Type-species, *Aleurolonga cassiae* sp. n.

The structure of *A. cassiae*, the new species described below, is quite unlike that of any other previously described whitefly. The elongate shape itself is not particularly unusual, this is found in several other genera such as *Aleurocybotus* and *Dialeurolonga*. However the dorsal ridges and the prolongation of the antero- and postero-lateral margins are unique. For this reason a new genus is here defined to contain this single species.

Pupal case : Very elongate, breadth about one-third of length, anterior and posterior lateral margins prolonged making outline rather rectangular. These corners each bear a seta. Anterior and posterior marginal setae present. Dorsal disc elevated by two parallel ridges which connect anterior and posterior corners. A series of small setae in sub-dorsum associated with the ridges. No long dorsal setae. Abdominal segment seven much shorter than six or eight, which are subequal. Tracheal folds faintly indicated, tracheal pore areas poorly defined from margin. Vasiform orifice cordate, lingula tip expanded, partially exposed. Caudal furrow distinct.

## *Aleurolonga cassiae* sp. n.

(Text-figs. 14 and 15)

Pupal case : 1·6 × 0·5 mm. to 2·0 × 0·7 mm. On the lower surface of leaves, usually parallel to margin or midrib. White, with little wax.

Margin : Finely crenulate, tracheal pore areas indicated by faint thickening of marginal crenulations, occasionally accompanied by some markings on dorsal sub-margin. Anterior and posterior marginal setae present, also four pairs of marginal setae on well developed bases, two at anterior and two at posterior corners. Sub-margin with many transverse lines, two rows of small pores, one close to margin one close to longitudinal ridge.

Dorsal disc : Elevated from sub-margin by two longitudinal ridges which connect anterior and posterior corners, with reticulate markings medially. Small paired setae on cephalic, first and eighth abdominal segments, the latter very close to orifice. Similar setae close to, occasionally on, submarginal ridges ; six pairs on cephalothorax, five pairs on abdomen on segments two, four, five, seven and eight respectively. A row of pores just mesad of longitudinal ridges. Transverse moulting suture reaches margin. Abdominal sutures not heavily defined, particularly in sub-dorsum. Vasiform orifice elongate-cordate, open at posterior, half filled by operculum which partially conceals expanded spatulate tip of lingula. Caudal furrow very distinct, 0·14–0·20 mm.

Ventral surface: Thoracic tracheal folds weakly defined. Anterior abdominal spiracles small, posterior spiracles large with two setae antero-mesad. Antennae short and stout, barely exceeding first leg. A small seta on inner basal area of meso- and metathoracic legs, and a pair of minute setae anterior to rostrum.

2nd instar: Submarginal longitudinal ridges and associated setae as in pupal case, anterior and posterior corners not developed, but the four pairs of marginal setae present.

Holotype pupal case. NIGERIA: Moor Plantation, Ibadan, on *Cassia siamea*, i.1960, (*L. A. M.*).

Paratypes; seventeen pupal cases, collection data as for the holotype.

## *ALEUROMARGINATUS* Corbett, 1935

Type-species: *Aleuromarginatus tephrosiae* Corbett, 1935.

Three species are at present included in this genus. However the characters given by Singh (1940) in his description of *A. indica* do not separate this species from the type-species, whilst on the other hand examination of type material of *A. serdangensis* Takahashi, 1955, in the British Museum indicates that this species bears little relationship to the type-species.

### ***Aleuromarginatus tephrosiae*** Corbett, 1935

(Text-figs. 12 and 13)

Material examined: Fourteen pupal cases (syntypes), SIERRA LEONE: Newton, on *Tephrosia candida*, xi.1932 (*E. Hargreaves*); four pupal cases, Freetown, on " Leguminous plant," ix.1924 (*E. Hargreaves*). Six pupal cases, NIGERIA: Ibadan, Moor Plantation on *Cassia siamea*, July, 1960 (*L. A. M.*).

The material listed above is only tentatively identified as being conspecific with the syntypes. None of the original specimens appear to be fully mature pupal cases; moreover, most of them have been parasitized and all of them have clearly been treated with caustic potash. Until more material becomes available, from which the variation in pigmentation and number of small dorsal setae can be estimated, an adequate description of this species cannot be given. The available specimens are quite distinctive however. They are about one millimetre in length, almost colourless, with a strongly toothed margin and a pore at the base of each tooth. The transverse moulting suture almost reaches the margin, and the lingula is exposed within the broadly cordate vasiform orifice. The large marginal pores, referred to by Corbett as a second row of marginal teeth, are probably associated with the broad flat waxy fringe which surrounds these insects in life.

## ***ALEUROPLATUS*** Quaintance & Baker, 1917

Type-species : *Aleurodes quercus-aquaticae* Qu., 1900.

This genus is not at present well defined. Russell (1958) refers to a few characters which the species to be included do not possess, whilst defining the genus *Orchamoplatus* ; sub-marginal wax glands absent ; tracheal pore areas not sharply delimited from the rest of the margin ; setae absent from the first abdominal segment. However the genus is used in a broad sense to contain a number of forms, the relationships of which are far from clear. Three such species included in the genus here may be separated by the following key.

1 Pupal case black . . . . . . . . . . . . . ***A. andropogoni***
– Pupal case colourless or lightly pigmented . . . . . . . . . 2
2 Large pore close to each marginal crenulation . . . . . . ***A. periplocae***
– No large marginal pores . . . . . . . . . . . ***A. fimbriae***

### ***Aleuroplatus andropogoni*** Dozier, 1934

(Text-figs. 16 and 17)

Pupal case : Black, slightly pointed anteriorly but broadly round at posterior. Broadest across first abdominal segment, slightly constricted at tracheal folds. Length 1·10 mm. Breadth 0·95 mm.

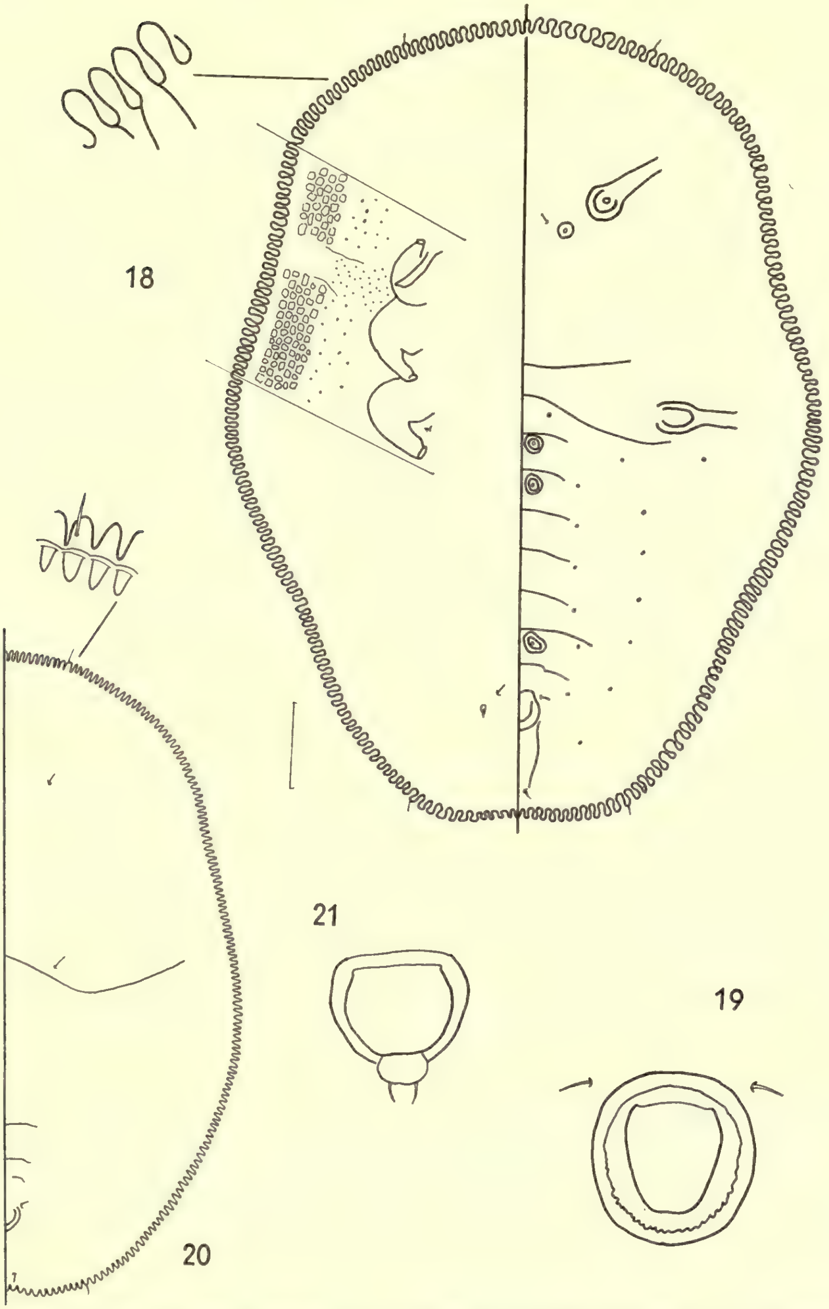
Margin : Strongly crenulate, vertical, elevating dorsal disc from ventral surface, with a pore associated with each crenulation. Tracheal folds not developed, no marginal setae seen.

Dorsal disc : Flat, segmental sutures indicated weakly, abdominal segment eight rather shorter than segments seven or six. Transverse moulting suture bends sharply to anterior, just failing to reach margin. A single pair of short thick setae on mesothorax. Eighth abdominal setae longer than orifice, colourless, arising close to orifice and about one third of its length from its anterior margin. Vasiform orifice very slightly elevated, filled by operculum which obscures lingula. Internally with distinctive sculpture consisting of three teeth with basally a row of pores.

Ventral surface : Tracheal folds narrow, bearing medially many minute tubercles. Abdominal spiracles large. Adhesive organ not very large. A small seta at base of meso- and metathoracic leg.

Material examined : Two syntypes, CONGO : Lodja, on *Andropogon* sp., x.1929 (*J. Ghesquière*).

No illustration was given of this species in the original publication, and it is not recognizable from the description. A very similar insect has been collected by V. F. E. and L. A. M. on Coconut and Oil Palm Trees at Ibadan, and near Benin, in Southern Nigeria. The form from Palms differs from the syntypes of *A. andropogoni* in the internal sculpturation of the vasiform orifice. This may represent a specific difference, although no other differences have been observed between the two forms. Closely associated with the large black pupal cases on Palm Trees are smaller black oval specimens, the two forms being very similar in the structure of both the vasiform orifice and the margin. It is possible that these smaller pupal cases belong to the males of the species, a suggestion to which some support is lent, by the presence on the same slide as the syntypes of *A. andropogoni* of the ventral surface of a small, oval, black, whitefly pupal case.



FIGS. 18–21. 18. *Aleuroplatus fimbriae*—pupal case and detail of margin. 19. *A. fimbriae*—vasiform orifice. 20. *Aleuroplatus periplocae*—pupal case and detail of margin. 21. *A. periplocae*—vasiform orifice.

## *Aleuroplatus fimbriae* sp. n.

(Text-figs. 18 and 19)

Pupal case: 0·70 × 0·50 mm. to 1·00 × 0·75 mm. Males probably smaller than females. Markedly widest across first abdominal segment, anterior and posterior margins rather transverse. On lower surface of leaves, with little wax, white or frequently with brown or black markings.

Margin: With a fringe of distinctive teeth (8–10 in 0·08 mm.), each tooth twice as long as broad. Paired anterior and posterior marginal setae present. Tracheal pore area barely indicated.

Dorsal surface: Cephalic region with a pair of large tubercles, a ridge from each of these to margin. Similar paired ridges on metathorax. Similar tubercles on second, third and seventh abdominal segments, these tubercles with a pore. A pair of similar pores near cephalic setae, but on much smaller tubercles. Ridges, tubercles and rhachis, variously pigmented, occasionally quite black. Dorsal pores and porettes in three rows, in sub-margin, sub-dorsum and bordering rhachis respectively. Cephalic and eighth abdominal segments with a pair of fine setae. Caudal setae usually small, dorsal, sub-marginal in position. Sub-margin with seven pairs of setae ($8\mu$) two pairs on cephalic segment, one pair on prothorax, mesothorax and abdominal segments four, six and seven. Metathoracic suture very strong, transverse. Transverse moulting suture deeply recurved. Vasiform orifice sub-circular, elongate rectangular operculum three-quarters fills orifice concealing (cylindrical?) lingula. Caudal furrow developed, occasionally with irregular tubercles near posterior margin.

Ventral surface: Sub-margin usually with many rectangular markings, interrupted only at tracheal folds. Mesad of these many raised dots. Ventral abdominal setae barely mesad of posterior spiracles. No setae seen at base of legs.

Holotype pupal case. NIGERIA: Moor Plantation, Ibadan, on *Cassia siamea* ii.1961 (*L. A. M.*).

Paratypes; Many pupal cases with the same host and locality data on various occasions i–vi.1961 (*E. A. J. & L. A. M.*). A single third instar nymph was also taken on *Tecoma stans*, GHANA: Tafo, v.1957 (*V. F. E.*).

This species has remarkable marginal teeth which distinguish it from most other whitefly. The dorsal pores on tubercules are also unusual in appearance, and the variable pigmentation associated with them and the rhachis can be rather confusing in a short series of specimens.

## *Aleuroplatus periplocae* (Dozier, 1934) comb. n.

(Text-figs. 20 and 21)

*Aleyrodes periplocae* Dozier, 1934.

Pupal case: Length 0·75 to 0·95 mm. Breadth 0·5 to 0·7 mm. Males probably smaller than females. Colourless, flat, broadest across second abdominal segment, rectangular at posterior. On leaf, with broad waxy fringe one-quarter of the width of the dorsum.

Margin: Crenulate (16 in 0·1 mm.), a large wax-secreting pore at base of each crenulation—referred to by Dozier as a second row of teeth. No tracheal pore differentiated. Anterior and posterior marginal setae present, caudal setae sub-marginal in position.

Dorsal surface: Sub-margin not separated. A pair of setae on cephalic, metathoracic, and eighth abdominal segments. Transverse moulting suture does not reach margin. Abdominal sutures very ill-defined, segment seven about two-thirds the length of segments six or eight. Vasiform orifice subcordate, almost filled by rectangular operculum. Lingula tip expanded, protrudes from posterior of orifice.

Material examined: Syntypes; ten pupal cases poorly mounted on one slide, and six specimens on leaves, Congo: Barambu, on *Periploca nigrescens*, viii.1925 (*J. Ghesquière*).

This species is most distinctive when seen on the host plant, due to the broad waxy fringe. When mounted for study however, the pupal cases are most undistinguished. The margin recalls that of *Aleuromarginatus*, although the extruded knobbed lingula is like that of *Aleurotulus*. The species agrees with *Aleuroplatus* in the absence of setae on the first abdominal segment, the lack of the thoracic tracheal pores, and the absence of sub-marginal pores.

## *ALEUROPTERIDIS* Mound, 1961

Type-species: *A. douglasi* Mound, 1961, here regarded as being synonymous with *Aleyrodes filicicola* Newstead, 1911, syn. n.

This genus, similar to *Tetralicia* in that the true margin is recurved ventrally, was described for four species all collected on ferns. Both dark and light species are included and these can be separated by the following key:—

| | | |
|---|---|---|
| 1 | Five pairs of sub-marginal setae anterior to thoracic tracheal pore . . . | ***A. eastopi*** |
| – | Four pairs of sub-marginal setae anterior to thoracic tracheal pore . . . . | 2 |
| 2 | Dorsal setae reach margin . . . . . . . . . . | ***A. hargreavesi*** |
| – | Dorsal setae small, not reaching margin . . . . . . . . . | 3 |
| 3 | Dark brown to black . . . . . . . . . . | ***A. jamesi*** |
| | Lightly pigmented . . . . . . . . . . | ***A. filicicola*** |

## ***Aleuropteridis filicicola*** (Newstead, 1911) **comb. n.**

*Aleyrodes filicicola* Newstead, 1911.
*Aleuropteridis douglasi* Mound, 1961. **syn. n.**

This species is not recognizable from its description, but type material on leaves was obtained from the Zoological Museum, Humboldt University, Berlin. These specimens have the dorsal disc almost entirely pigmented, with a pale margin, and no wax is present. The type specimens of *A. douglasi* have the pigment restricted to the mid-line, and there is a small marginal waxy palisade. No further differences could be found between the two groups of specimens, and they are here considered to be conspecific.

Material examined: Syntypes on leaves, and five pupal cases subsequently stained and mounted. Tanganyika: Sigithal near Amani, on ferns, viii.1902 (*Zimmermann*), Zoological Museum, Berlin, and British Museum (Natural History).

Holotype and paratypes of *A. douglasi*. England: Kew Gardens, Greenhouse, on *Pteris togoensis*, and *Cyclosorus dentatus*, 1891 (*J. W. Douglas*).

## ***Aleuropteridis eastopi*** Mound, 1961

Material examined: Holotype and eight paratypes, also four pupal cases on a slide bearing the same data as the type series but only recently found in the British Museum collection; Ghana: Tafo, on Ferns, 12.v.1957 (*V. F. E.*).

### *Aleuropteridis hargreavesi* Mound, 1961

Material examined: Holotype and three paratypes; SIERRA LEONE: Freetown, on Bush Fern, ix.1924 (*E. Hargreaves*).

### *Aleuropteridis jamesi* Mound, 1961

Material examined: Holotype and five slides bearing paratypes, also abundant mounted and unmounted material from the same locality; NIGERIA: Moor Plantation, Ibadan, on *Pteris togoensis*, near a stream on various dates from 1957 to 1961 (*E. A. J.*).

## *ALEUROTUBERCULATUS* Takahashi, 1932

Type-species: *Aleurotuberculatus gordoniae* Tak., 1932.

This is a fairly well defined genus of about fifty species, described mainly by Takahashi or Corbett from the Far East. The margin bears a series of tubercles, the vasiform orifice is open posteriorly to a wide caudal furrow, and each thoracic tracheal pore is a small circular pore usually difficult to see as it faces laterally.

### *Aleurotuberculatus nigeriae* **sp. n.**

(Text-figs. 22 and 23)

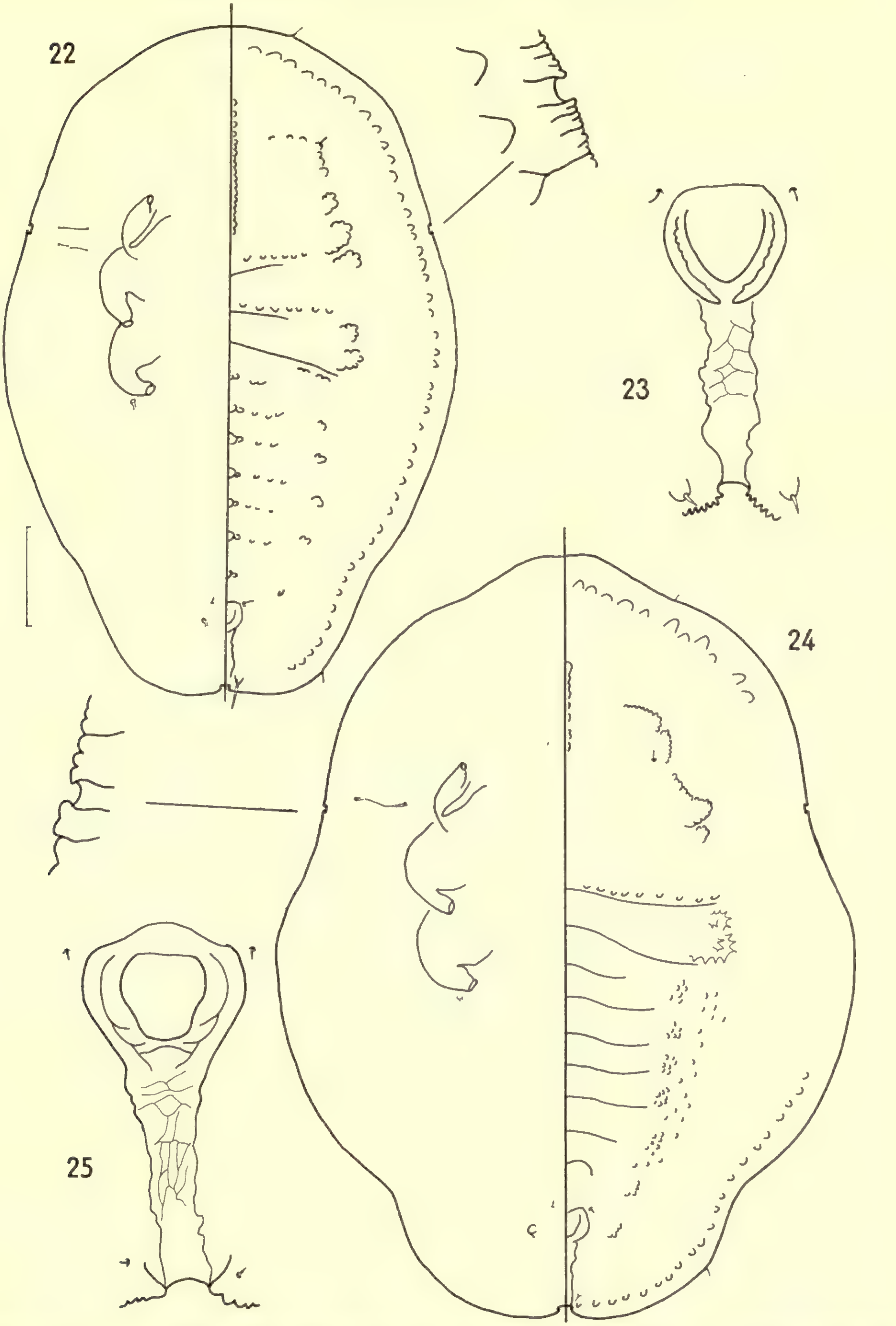
Pupal case: 0·7 × 0·5 mm. to 0·8 × 0·6 mm. On the lower surface of leaves, white, with little wax. A little brown pigment sometimes on first abdominal segment and metathoracic tubercles. Broadest across metathorax, deeply emarginate at posterior.

Margin: Finely and regularly crenulate (40 in 0·1 mm.). Paired anterior and posterior marginal setae present. Caudal setae on dorsal sub-marginal papillae. Tracheal pores like those of other members of the genus, smooth, shallow emarginations, posterior pore set in a deep cleft.

Dorsal surface: Sub-margin with about forty-seven tubercles on each side, varying considerably in degree of development, frequently ill-defined in region of thoracic tracheal pore. Ridges sometimes run from tubercles toward margin, particularly in cephalic region. Longitudinal moulting suture with apparently scalloped edge due to row of small papillae. Similar papillae define head of developing adult, and occur as transverse rows on posterior margin of each segment from prothorax to seventh abdominal segment. Two pairs of large tubercles on sub-dorsum of prothorax and metathorax, a single pair of similar tubercles on mesothorax and first abdominal segment. Smaller tubercles may occur sub-medially on each abdominal segment. Sub-dorsum granular. Median abdominal tubercles usually trilobed. Paired cephalic setae sometimes extend to margin of pupal case on antero-lateral margins of cephalic tubercles. When minute, these setae are situated on postero-lateral margins of cephalic tubercles. Eighth abdominal setae minute. Vasiform orifice sub-circular, emarginate at posterior. Operculum similar in shape nearly fills orifice, conceals cylindrical lingula. Caudal furrow very distinct, 0·04 to 0·06 mm.

Ventral surface: Tracheal folds indistinct. Anterior abdominal spiracles clearly visible, a pair of setae antero-mesad of posterior spiracles. No setae observed at base of legs.

Holotype pupal case. NIGERIA: Moor Plantation, Ibadan, on *Psidium guajava*, xii.1960 (*M. O. E.*).



FIGS. 22–25. 22. *Aleurotuberculatus nigeriae*—pupal case and detail of thoracic tracheal pore. 23. *A. nigeriae*—vasiform orifice and caudal margin. 24. *Aleurotuberculatus kusheriki*—pupal case and detail of thoracic tracheal pore. 25. *A. kusheriki*—vasiform orifice and caudal margin.

Paratypes; twenty-six pupal cases collected with holotype. Six pupal cases NIGERIA: Ibadan, on *Ficus asperifolia*, i.1960 (*M. O. E.*); seven pupal cases, Ibadan, on *Diospyros monbuttensis* x.1959 (*E. A. J.*).

This species was also collected commonly by V. F. Eastop on Guava at Ibadan, ii–iv,xi.1956, and this collector also found one pupal case on *Tecoma* sp., GHANA: Tafo, v.1957. Six pupal cases collected from an unknown plant, NIGERIA: Bida, ix.1960 (*L. A. M.*) are probably the same species.

The sculpturation of the dorsal surface is rather variable in this species. In some specimens the sub-dorsal abdominal tubercles are absent, and the sub-marginal tubercles and transverse rows of papillae are much reduced. This species differs from others described in the genus by the combination of its segmental transverse rows of papillae and elongate shape. It differs from *A. kusheriki*, described below, in the position of the cephalic setae anterior or lateral to the cephalic tubercles.

### ***Aleurotuberculatus kusheriki* sp. n.**

(Text-figs. 24 and 25)

Pupal case: 0·6 × 0·5 mm. to 0·9 × 0·6 mm. On the lower surface of leaves, white, broadest across first abdominal segment. Constricted at tracheal folds and at seventh abdominal segment. Slightly emarginate at posterior fold.

Margin: Finely but irregularly crenulate (30 in 0·1 mm.). Paired anterior and posterior marginal setae very small. Caudal setae minute on dorsal sub-terminal tubercles. Thoracic tracheal pores typical of genus but the emarginations may be very shallow or absent, the pore only distinguishable in such cases as a smooth portion of the crenulate margin. Posterior emargination smaller than in *A. nigeriae*.

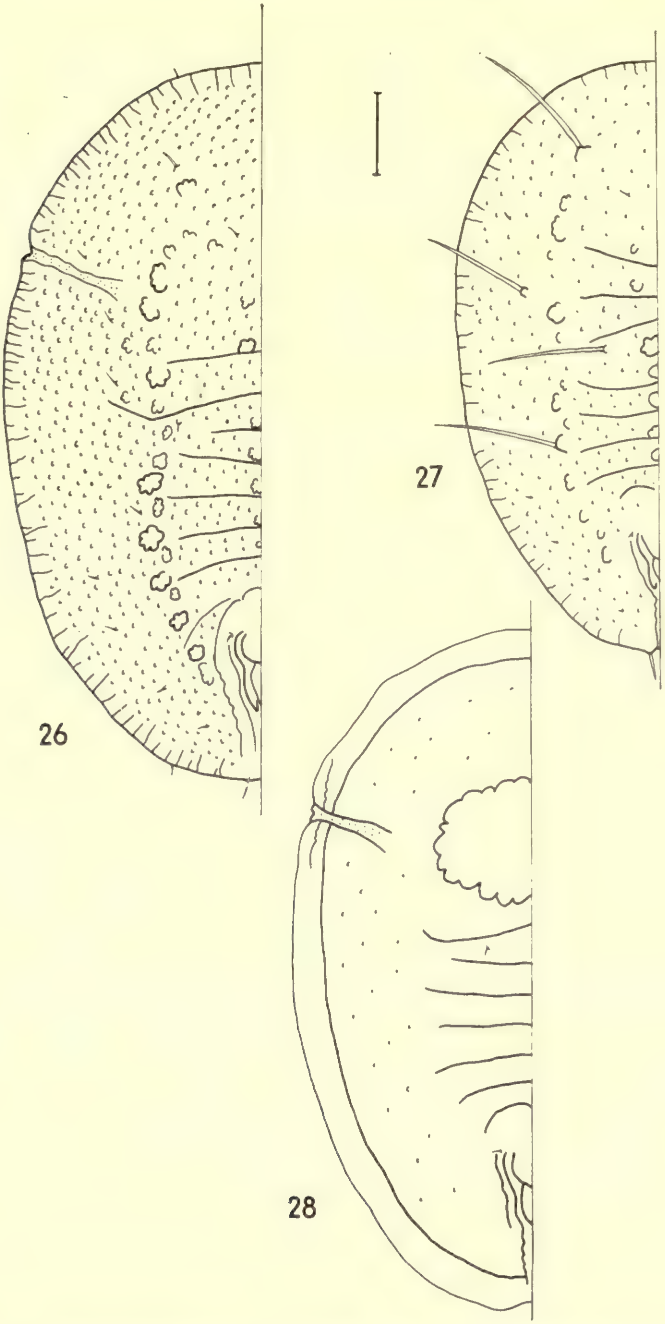
Dorsal surface: Sub-marginal tubercles imperfectly developed, except in caudal and cephalic regions, probably up to fifty on each side. Longitudinal moulting suture bordered by delicate sculpturation. This lace-like sculpturation is typical of the larger tubercles of this species, head region of developing adult defined by similar markings. Two pairs of large tubercles occur on the pro- and metathorax, and one pair on the mesothorax and first abdominal segment. Similar tubercles indicated on each succeeding abdominal segment, most strongly developed on eighth segment. Median abdominal tubercles similar in structure to thoracic tubercles. Sub-dorsal region with many papillae. Transverse rows of papillae on pro- and mesothoracic sutures. Paired cephalic setae small, mesad of cephalic tubercles, between these and prothoracic tubercles. Eighth abdominal setae minute, anterior to orifice. Sixth and seventh segments subequal in length, two thirds of eight. Vasiform orifice wider than long, rounded laterally. Operculum nearly fills orifice, concealing lingula. Caudal furrow distinct, 0·05 to 0·08 mm.

Ventral surface: As in previous species.

Holotype pupal case. NORTH NIGERIA: Kusheriki, on undetermined plant, ix.1960 (*L. A. M.*).

Paratypes; seven pupal cases collected with the holotype.

This species is characterized by the lace-like sculpturation of the dorsal tubercles, and the small papillae on the sub-dorsum. It is similar to *A. lithocarpi* Tak. from which it differs in the size and disposition of the dorsal setae. It is close to *Aleuroclava complex* Singh, but differs in the deeper posterior tracheal cleft and the presence of thoracic tracheal pores.



Figs. 26–28. *Bemisia hancocki*. 26. Pupal case. 27. Pupal case from hairy leaf. 28. Parasitized pupal case.

## *BEMISIA* Quaintance & Baker, 1914

Type-species: *Aleyrodes inconspicua* Qu., 1900, a synonym of *Bemisia tabaci* (Gennadius, 1889) Russell, 1958.

The species included in this genus have an elongate-triangular vasiform orifice, with a spatulate lingula. In view of the synonymies given by Russell (1958) there are now only two recognizable species from West Africa. These can be separated by the following characters.

A Caudal setae less than half length of caudal furrow; transverse markings in caudal furrow . . . . . . . . . . . . . . ***B. hancocki***

B Caudal setae more than half length of caudal furrow; no transverse markings in caudal furrow . . . . . . . . . . . . . ***B. tabaci***

### ***Bemisia tabaci*** (Gennadius, 1889)

(Text-fig. 31)

The host range of this species is very great, and the structure of the pupal cases varies depending on the host plant upon which it has developed (Mound, 1962 & 1963). Included here as synonyms are *B. goldingi* and *B. nigeriensis*, described by Corbett (1935) from Ibadan, Nigeria, on Cotton and Cassava respectively, also *B. gossypiperda* Misra & Lamba, recorded from the Congo by Ghesquière (1934) as variety *mosaicivectura* nov. The adults of this species act as the vectors of leaf curl viruses on Cassava, Cotton, Tobacco, and Peppers in West Africa.

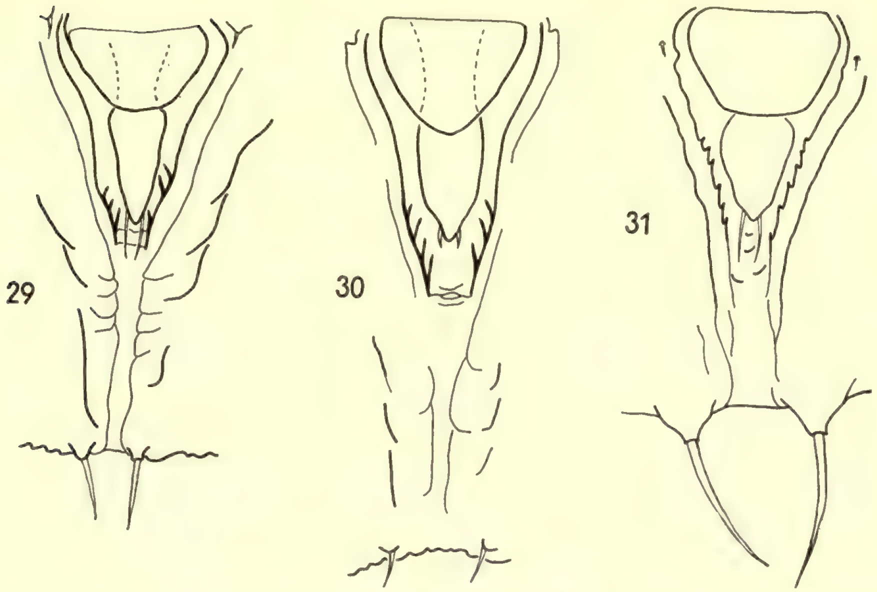
### ***Bemisia hancocki*** Corbett, 1936

(Text-figs. 26 to 30)

Pupal case: 0·98 × 0·72 mm. to 0·67 × 0·45 mm. Males probably smaller than females. On the lower surface of leaves, white with very little wax. Oval in shape, broadest across metathorax, slightly tapered to posterior.

Margin: Smooth to finely but irregularly crenulate (18 in 0·1 mm.), with faint lines extending across sub-margin. Anterior and posterior marginal setae present. Thoracic pores usually indicated by slight thickening, and sometimes pigmentation, of up to ten marginal crenulations; occasionally not evident at all. Thoracic and posterior pore regions slightly emarginate.

Dorsal surface: Original description refers to " a ring of minute sub-marginal spines ". These are not present in the specimens from the type series at the British Museum, and the " spines " referred to are apparently small tubercles. Sub-dorsal area typically very granular, delimited from median area by twenty-two large paired tubercles. These sub-dorsal tubercles on abdomen as follows; one on second, and two on third to seventh segments, the first and the last two of the series being small, the remaining pairs each of one large and one small tubercle. Three pairs of similar sub-dorsal tubercles on both meso- and metathorax, two on prothorax, and three in cephalic region. A pair of similar but smaller tubercles sometimes medially on pro- and mesothorax. Median tubercles usually present on first five abdominal segments. All these tubercles occasionally reduced, apparently absent. Sub-dorsal setae on cephalic region, pro-, meso- and metathorax, and abdominal segments four to eight; those on prothorax and abdominal segments five to eight often closer to margin than to sub-dorsal tubercles, usually less than 3 $\mu$ in length. Remaining sub-dorsal setae closer to tubercles than to margin, occasionally elongate, extending beyond body margin. Three pairs of sub-marginal setae occasionally seen in cephalic



FIGS. 29–31. 29 & 30. *Bemisia hancocki*—vasiform orifice. 31. *B. tabaci*—vasiform orifice.

region, 3 μ in length. Dorsal setae on cephalic, first, and eighth abdominal segments, the former two pairs occasionally elongate. Caudal setae not elongate, 40 μ, on small tubercles. Transverse moulting suture not reaching margin, anterior margin of segment eight confluent with posterior margin of segment six, only seven segments visible in mid-line. Three paired longitudinal rows of dorsal pores, often difficult to see, in sub-margin, sub-dorsum, and close to rhachis. Vasiform orifice elongate-triangular, slightly constricted behind anterior half, posterior-lateral margins with about four internally projecting ridges, widely open at posterior, length 0·07 to 0·11 mm., breadth 0·05 to 0·07 mm. Operculum sub-cordate, filling about half of orifice. Lingula-tip highly variable, conical to elongate-triangular, or spatulate and barely separated from lingula neck. Caudal furrow well defined, 0·05 to 0·09 mm., with one or more transverse ridges anteriorly. Caudal ridges with transverse markings.

Ventral surface : Tracheal folds rather narrow, defined by many minute tubercles, occasionally not apparent. Posterior abdominal spiracles well developed, with a pair of fine setae. Anterior abdominal spiracles visible. A minute seta at the base of meso- and metathoracic legs. Antennae short with acute tip, barely reaching mesothoracic leg.

Material examined : One pupal case, ?paratype, the only remaining specimen from the type host, UGANDA : Eastern Province, on Cotton, 1934 (*G. L. R. Hancock*). Two pupal cases with the same Museum Collection Number as the type, on *Vigna catjang*, 6.viii.1934 (*G. L. R. Hancock*). Four pupal cases, Kiyunga, on Cotton, ii.1924 (*H. Hargreaves*), three pupal cases, Serere, on Groundnut, vi.1962 (*J. C. Davies*).

This species has been taken on Cassava at the following places ; SIERRA LEONE : Njala and Newton, 1960 (*P. Rushton*) ; NIGERIA : Bida, x.1960 (*L. A. M.*) ; CAMEROONS ; Bamenda, xi.1959 (*C. P. Hoyt*) ; SUDAN : Yambio, iv.1962 (*F. A. Mitwalli*). Other recorded hosts are *Cassia siamea*, *Cassia petersiana*, *Zizyphus spina-*

*christi, Lonchocarpus sericeus, Chaetacme aristata, Urena lobata,* and *Bridelia* sp. Specimens have been seen from the following places ; NATAL : Durban ; MALAWI : Boer River ; KENYA : Nairobi ; SUDAN : Yambio, Dilling, Wad Medani ; CONGO : Stanleyville ; MADAGASCAR : Nossi Bè.

The variation shown by *B. hancocki* is very great, almost equal to that of *B. tabaci.* As in the latter species, the most variable characters are the overall size and shape, and the number and definition of the tubercles. This redescription gives the maximum number of tubercles, but within an otherwise typical population, specimens may be found with no dorsal tubercles visible, i.e., with an almost smooth dorsum. The dorsal setae are only rarely elongate, but the microsetae can be very difficult to demonstrate due to their minute size. The shape of the vasiform orifice, with its internal sculpturing and transverse markings at the posterior end, is typical of the species. However the shape of the lingula is highly variable.

A further cause of variation is the presence of Aphelinid parasites in certain specimens. Such parasitized pupal cases, recognizable by the round parasite emergence hole, usually have a smooth margin with a darkly staining sub-marginal line. The parasite pupal case and meconium are not always retained within the host. Parasites from Sierra Leone were identified by B. D. Burks of the United States National Museum as *Prospaltella sublutea* Silv., and *Eretmoceros ?masii* Silv.

The relative status of the two species *B. tabaci* and *B. hancocki* is of considerable interest. *B. tabaci* has been recorded from Cassava in most parts of Africa, and it is usually found on the plants as a pure infestation. At the following places it was found however in association with *B. hancocki* ; Njala, Sierra Leone ; Bida, Nigeria ; Bamenda, Cameroons ; Yambio, Sudan ; Stanleyville, Congo. At four of these sites *B. tabaci* constituted the major part of the total whitefly population, but at Njala this species was virtually replaced by *B. hancocki.* This situation may be correlated with the absence from Njala in 1960 of Cassava Mosaic Virus, of which disease *B. tabaci* is the vector. Samples of leaves from the coastal region of Sierra Leone were found however not only to bear *B. tabaci* pupal cases in fair numbers, they also showed typical virus disease symptoms.

A possible explanation of these observations is that *B. hancocki* is not a vector of the mosaic virus, particularly as the disease is almost ubiquitous on Cassava in the high rainfall areas of the West African coast. This virus is known to have spread across Nigeria from East to West between 1930 and 1940 (unpublished records of the Federal Department of Agricultural Research, Nigeria). Moreover, Pearson (1949) suggests that another whitefly-borne virus, cotton leaf-curl disease, spread from West Africa to Sudan between 1920 and 1930. It seems possible that these sudden movements of virus diseases reflect earlier movements of insect populations. *B. hancocki* may be indigenous to Africa. *B. tabaci* is possibly of more recent introduction, from India through East Africa where Cassava Mosaic was first recorded, and has gradually replaced the original species.

## ***CORBETTIA*** Dozier, 1934

Type-species: *Corbettia milletiacola* Doz., 1934.

This genus has recently been revised by Russell (1960) from whom the following abbreviated key is adapted. The pupal cases all have a paired longitudinal row of papillae in the sub-dorsum, and sixteen pairs of sub-marginal setae, including the caudal setae. The only species not listed here, *C. tamarindi* Tak., comes from Madagascar.

| | | |
|---|---|---|
| 1 | Pro-mesothoracic suture extending to body margin . . . . | ***C. grandis*** |
| – | Pro-mesothoracic suture not reaching margin . . . . . . . . | 2 |
| 2 | Bases of elongate setae nearer sub-dorsal papillae than to margin . . | ***C. indentata*** |
| – | Bases of elongate setae nearer margin than to sub-dorsal papillae, or no elongate setae . . . . . . . . . . . . . . . . | 3 |
| 3 | Eleven long setae on one sub-margin, not all the corresponding setae on opposite side elongate . . . . . . . . . . . . . . | ***C. graminis*** |
| – | Six pairs of sub-marginal setae elongate . . . . . . | ***C. milletiacola*** |
| – | Two, three, or four pairs of elongate sub-marginal setae . . . . | ***C. baphiae*** |
| – | Only one pair of elongate sub-marginal setae, the caudal setae . . | ***C. tamarindi*** |

### ***Corbettia milletiacola*** Dozier, 1934

The collection data for the lectotype and one other specimen from the type series in the British Museum are as follows:—BELGIAN CONGO: Kole (Sankuru), on *Milletia versicola* Welw., 22.i.1928 (*J. Ghesquière*). However Russell (1960: 129) gives reasons for doubting the accuracy of this data.

New records. NIGERIA: Moor Plantation, Ibadan, on *Lonchocarpus sericeus* and *Desmodium lasiocarpus*, iv–vii.1956 (*V. F. E.*), also Olokemeji, near Ibadan, on *Mucuna* sp., v.1956 (*E. A. J.*).

### ***Corbettia baphiae*** Russell, 1960

No type material is available at the British Museum, but two pupal cases determined as this species from the description were removed from plants in the Museum herbarium; TANGANYIKA: Morogoro, on *Cassia auriculata*, v.1933. The species was described from *Baphia* sp., CONGO: Eala, v.1935, and vii.1936.

### ***Corbettia indentata*** Russell, 1960

No material is available at the British Museum. The species was described from *Milletia* and *Tephrosia* sp., CONGO: Sankuru, Elizabethville, and Eala.

### ***Corbettia grandis*** Russell, 1960

No material is available at the British Museum. The species was described from *Milletia* sp., CONGO: Eala, ix.1936.

## *Corbettia graminis* sp. n.

(Text-fig. 32)

Pupal case : ?Female 1·60 × 0·85 mm. ?Male 1·10 × 0·55 mm. Elliptical in outline, but distinctly bilaterally asymmetrical. Lightly but variously pigmented. Sub-dorsal papillae, bases of sub-marginal setae, and abdominal segment two usually brown. Segments seven and eight with or without pigment.

Margin : Smooth or with broad shallow crenulations (7 in 0·1 mm.). Tracheal pore area not indicated. Posterior marginal setae present, more than 10 μ in length. Anterior marginal setae not seen. Sub-margin with sixteen pairs of setae, including caudal setae, eight pairs on both cephalothorax and abdomen. Eleven pairs including caudal setae elongate (100 μ), on large bases, close to margin ; five pairs, second, fifth, and seventh cephalothoracic, and first and seventh abdominal small (25 μ), on small tubercles mesad of large setae. Setae of one side always reduced in size. Sub-marginal setae on following segments ; cephalic segment four pairs, prothorax one pair, mesothorax two pairs, metathorax one pair, abdominal segments two, three, four, six, and seven each with one pair, segment eight two pairs. Sub-dorsum with radiating anastomosing lines and rows of small tubercles. Sub-medial area demarcated by two longitudinal rows of about seventy-five papillae, each with a minute apical pore. The rows tend to bifurcate close to vasiform orifice. Rhachis with faint transverse rows of small tubercles across abdominal segments, a small pore on either side of each segment, and a pair of setae on cephalic, meso- and metathoracic segments, and abdominal segments one and eight. Segment seven less than half length of six. Orifice sub-circular, length 58 μ, breadth 60 μ, anterior rim 8 μ long. Orifice three times its length from hind margin of body, a large tooth on posterior median border, internal margin rugose. Operculum transversely rectangular, half filling orifice, with rugose posterior margin. Spatulate lingula exposed, included. Caudal furrow not clearly developed.

Ventral surface : Thoracic tracheal folds not apparent, posterior fold weak. Anterior abdominal spiracles well developed, underlying second abdominal suture. Paired abdominal setae near posterior spiracles. Antennae rather elongate, transversely striate with minute tubercles, in female reaching just posterior to first spiracle, in male almost to second spiracle.

Holotype, ?♀ pupal case. NIGERIA : Onitsha, at base of grass, 13.i.1957 (*V. F. E.*).

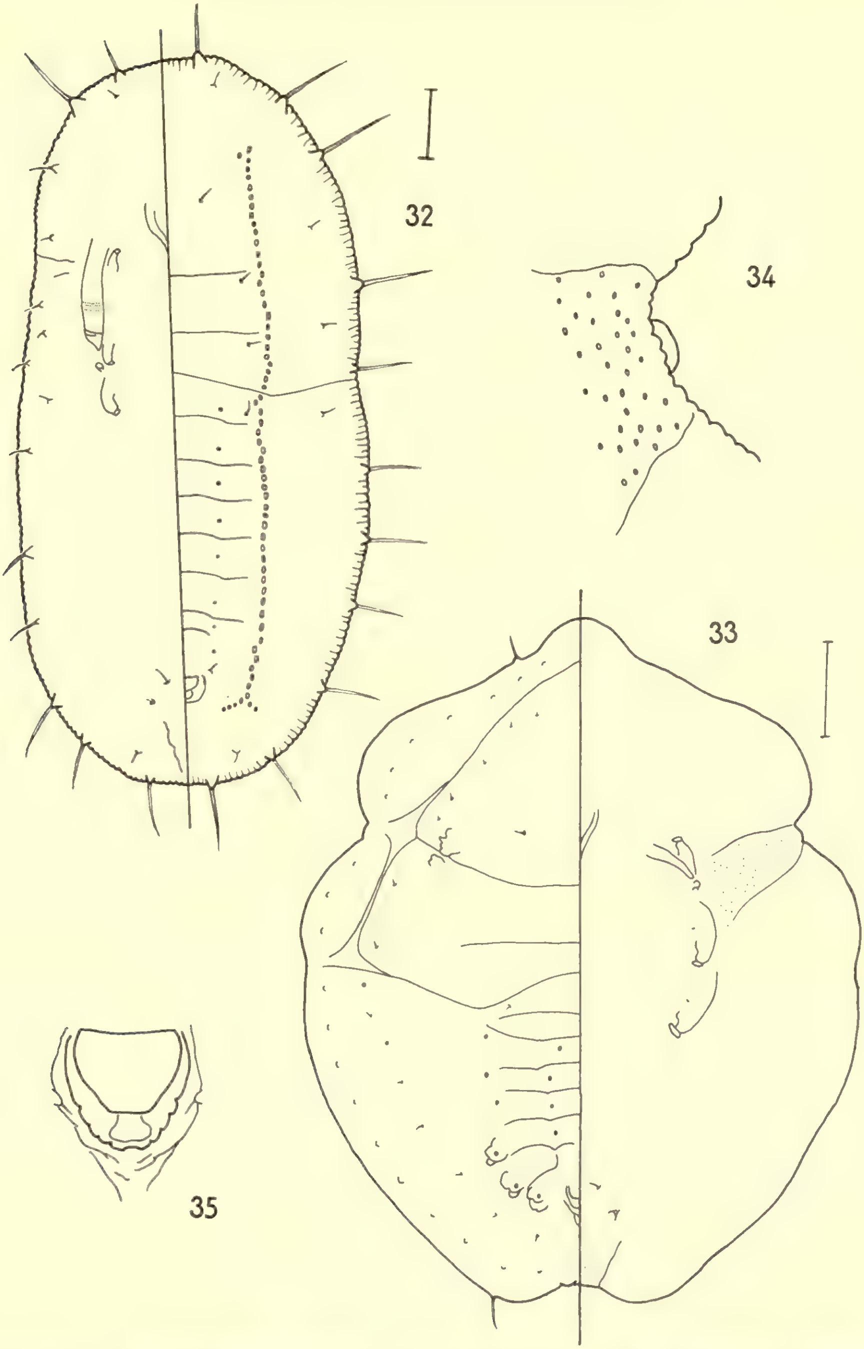
Paratypes, five ?♀ and five ?♂ pupal cases collected at the same time as the holotype.

This species is quite closely related to *C. milletiacola*, but differs from that species in its much larger size and in the possession of a larger number of elongate sub-marginal setae. The bilateral assymetry of the available specimens is probably the result of restricted space for growth at the base of the grass on which they were taken. The host record is particularly interesting as all the other species in the genus have been taken on leguminous plants.

## *DIALEURODES* Cockerell, 1902

Type-species : *Aleyrodes citri* Ashmead, 1885.

Species in this genus have well developed pores, usually with internal teeth, the tracheal folds are indicated by many fine tubercles, and the small vasiform orifice often has a row of teeth within its posterior margin.



FIGS. 32–35. 32. *Corbettia graminis*—pupal case (? male). N.B. The dorsal sub-marginal setae also drawn in ventral view. 33–35. *Dialeurolonga emarginata*. 33. Pupal case. 34. Thoracic tracheal pore. 35. Vasiform orifice.

### *Dialeurodes kirkaldyi* (Kotinsky, 1907)

This species was described from Jasmine in Honolulu, and an account of its distribution and host range has recently been published by Russell (1964). There are specimens in the British Museum (Natural History) from *Allamanda neriifolia*, GHANA: Aburi, iii.1922 (*W. H. Patterson*). The pupal case is slightly constricted behind the thoracic tracheal pores, and the vasiform orifice has an anterior rim more than half the length of the operculum. The eighth abdominal setae are lateral to the orifice.

## *DIALEUROLONGA* Dozier, 1928

Type-species: *Dialeurodes* (*Dialeurolonga*) *elongata* Dozier, 1928.

This genus was redefined by Takahashi (1951) as a full genus, although not all the species included are closely related. It is separated from *Dialeurodes* by the characters listed in the key, although any one or more of these characters may be absent in a given species. Of the three species here described as new, *D. hoyti* and *D. akureensis* seem to be related to *D. angustata* and *D. bambusae* in the absence of a large spine at the base of the legs and the presence of the caudal setae near the hind margin. *D. emarginata* however is less closely related to the group in the complete reduction of abdominal segment seven, and the anterior extension of the transverse moulting suture. The four species referred to here may be separated by the following key.

1 Pupal case twice as long as broad . . . . . . . . . . . 2
– Pupal case not so long . . . . . . . . . . . . . . 3
2 Tracheal pores indicated by strengthened marginal crenulations . . . **D. akureensis**
– Tracheal pores are true pores enclosing an internal tooth . . . . . **D. hoyti**
3 Pupal case deeply emarginate; transverse moulting suture bends to anterior and meets in mid-line . . . . . . . . . . . . **D. emarginata**
– Pupal case smoothly elliptical; transverse moulting suture extends nearly to lateral margin . . . . . . . . . . . . . . **D. africana**

### *Dialeurolonga africana* (Newstead, 1921)

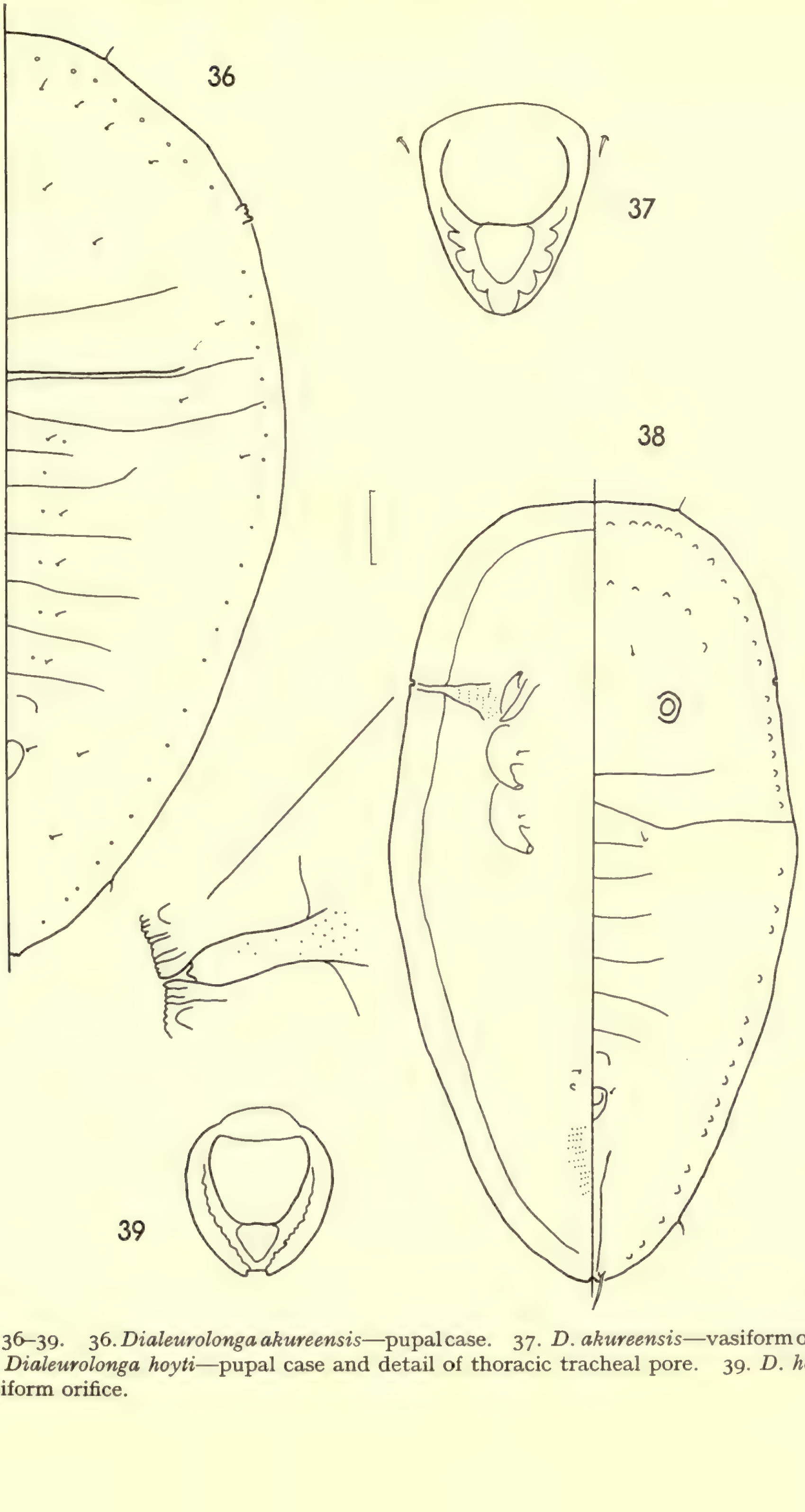
*Aleurodes africana* Newstead, 1921.
*Dialeurolonga africana* (Newstead) Takahashi, 1955: 393.

The pupal cases of this species were described as the food of the larvae of *Eublemma scitula*, a noctuid moth. The original record was NIGERIA: Ibadan, Moor Plantation, on *Salacia* sp., v.1917 (*C. O. Farquharson*). Type material is not available at the British Museum (Natural History), and the host plant, which was determined at Kew Herbarium, has not been preserved.

### *Dialeurolonga hoyti* sp. n.

(Text-figs. 38 and 39)

Pupal case: 1·2 × 0·6 mm. On the lower surface of leaves, usually alongside a vein. White with little wax. Elongate triangular in shape, asymmetric, broadest across first abdominal segment. Anterior border transverse, posterior acute.



FIGS. 36–39. 36. *Dialeurolonga akureensis*—pupal case. 37. *D. akureensis*—vasiform orifice. 38. *Dialeurolonga hoyti*—pupal case and detail of thoracic tracheal pore. 39. *D. hoyti*—vasiform orifice.

Margin : Finely crenulate, the crenulations small and regular (36 in 0·1 mm.) with fine lines extending for a short distance medially across sub-margin. Paired anterior and posterior marginal setae present. Caudal setae on dorsal sub-terminal tubercles. Tracheal pores distinct as pores, appearing triangular in mounted specimens with apex to exterior. Thoracic pores with a single tooth on inner dorsal margin, posterior pore with two such teeth.

Dorsal surface : Sub-margin usually with a series of about one hundred triangular papillae. Five similar papillae in a row on each side in cephalic sub-dorsum. Two paired rows of segmental pores, in sub-dorsum and close to rhachis respectively. A pair of large tubercles dorsal to anterior spiracles. Mesothoracic suture distinct, moulting suture almost transverse, reaching margin. Small paired setae on cephalic, first and eighth abdominal segments. Segment seven about two-thirds length of six or eight. Vasiform orifice sub-cordate, postero-lateral margins rugose, with a large tooth medially. Operculum half fills orifice, exposing D-shaped lingula knob. Caudal furrow very distinct, 0·19–0·20 mm.

Ventral surface : Sub-marginal region delimited by a suture-like fold interrupted only at tracheal folds. Tracheal folds clearly defined and bearing transverse rows of fine tubercles. A pair of setae mesad of the posterior abdominal spiracles, one or more very small setae near bases of meso- and metathoracic legs. Antennae slender, reaching mesothoracic leg, not sexually dimorphic. The chitin bears the imprint of the stomata and epidermal cells of the host plant.

Adult female : Paronychium with a long angular tip. Terminal antennal segment long and finely tapered.

Holotype pupal case. NIGERIA : Agege near Lagos, on Coffee, xi.1959 (*C. P. Hoyt*).

Paratypes ; eight pupal cases and two adult females collected with the holotype.

This species resembles the type-species in its elongate shape, but differs from it in the transverse anterior margin and the absence of a large pore anterior to the orifice. The elongate terminal antennal segment of the adult is similar to that figured by Singh (1931) for *D. elongata*.

## ***Dialeurolonga akureensis* sp. n.**

(Text-figs. 36 and 37)

Pupal case : 1·4 × 0·8 mm. to 1·8 × 1·1 mm. Elongate triangular in shape, broadest across first abdominal suture. Anterior border rather transverse, posterior acute.

Margin : Finely crenulate, lines extending medially across the sub-margin. Paired anterior and posterior marginal setae present. Caudal setae on tubercles antero-laterad of tracheal pore. Tracheal pores distinguished by about six heavily sclerotized marginal crenulations.

Dorsal surface : Sub-margin with a series of tuberculate pores, similar pores scattered throughout dorsum. Mesothoracic suture very clear, straight, extending to sub-margin. Transverse moulting suture does not reach margin. Small paired setae present as follows ; four pairs in cephalic sub-dorsum ; one pair each on cephalic and prothoracic dorsum ; two pairs on mesothorax and one pair on metathorax in sub-dorsum ; a single pair on sub-dorsum of second abdominal segment and dorsum of remaining abdominal segments. Vasiform orifice cordate, several ridges extend from rugose postero-lateral border over inner surface. Operculum rectangular, more than half filling orifice. Lingula tip exposed, included, broadly pyriform. Caudal furrow very distinct, 0·27–0·36 mm.

Ventral surface : Thoracic tracheal folds with few tubercles, but posterior tracheal fold well defined by many transverse rows of fine tubercles. Antennae short with a terminal hook. A pair of fine setae mesad of posterior spiracles.

Holotype pupal case. NIGERIA: Akure, on leaves of unidentified tree, i.1957 (*V. F. E.*).

Paratypes; eight pupal cases collected with the holotype.

Although this resembles other members of the genus in the presence of a submarginal row of pores and the shape of the orifice, it differs from these species in that the tracheal pore area is composed of a row of teeth and does not form a true pore. Both this and the preceding species, *D. hoyti*, are apparently related to *D. angustata* and *D. bambusae* described by Takahashi from Madagascar.

### *Dialeurolonga emarginata* sp. n.

(Text-figs. 33–35)

Pupal case: 0·75 × 0·60 mm. to 0·80 × 0·75 mm. White, but sometimes with an internal bright orange area medially. Broadest across mesothorax, deeply emarginate at thoracic and posterior tracheal folds, acute anteriorly.

Margin: Smoothly crenulate (22 in 0·1 mm.), with faint radial lines across sub-margin. Anterior and posterior marginal setae 30 μ in length, on stout bases. Tracheal pores covered by a smooth rounded lobe 15 μ in length. Caudal setae minute, close to margin.

Dorsal surface: Sub-margin with about forty pores on small tubercles. Three paired rows of similar pores, in sub-dorsum, sub-medially, and bordering rhachis. Sub-median pores on segments six, seven, and eight are raised on large tubercles. Transverse moulting suture does not reach margin, bends forward and meets near anterior end of pupal case, thus forming a triangular emergence hole. Prothoracic suture reaches this moulting suture. Both transverse moulting suture and prothoracic suture are apparently extended to margin. Second abdominal suture bends to anterior. Pockets of eighth abdominal segment confluent with sixth abdominal suture, thus seventh segment apparently occluded in mid-line. Small cephalic setae dorsolateral to rostrum, similar setae on first abdominal segment. Setae of eighth abdominal segment minute, close to orifice and midway along its length. Cephalo-thorax with seven pairs of setae in sub-dorsum, close to moulting suture. Sub-dorsal setae on abdominal segments two, and four to eight. Vasiform orifice cordate, 0·03 mm. long, inner postero-lateral margins toothed. Operculum almost semicircular, three-quarters fills orifice. Expanded tip of lingula exposed, included. Caudal furrow 0·1 mm.

Ventral surface: Tracheal folds broad, with many small tubercles. Anterior abdominal spiracles small. Paired fine setae anterior to rostrum and posterior spiracles. A small seta at base of meso- and metathoracic legs. Antennae thin, reaching to first spiracle.

Holotype pupal case. NIGERIA: Olokomeji near Ibadan, on *Cola cordifolia*, iii.1961 (*E. A. J.*).

Paratypes; five pupal cases collected with the holotype, and nine pupal cases at the same site on *Acanthocleista vogelii*, iii.1961 (*E. A. J.*).

This new species is put in the genus in view of the sub-marginal pores. It differs in shape from all other species described in *Dialeurolonga*. In general appearance it shows similarities to *Dialeurodes shoreae* Corbett from Malaya, but that species has a series of setae in the sub-margin, not in the sub-dorsum.

### ***NEOMASKELLIA*** Quaintance & Baker, 1913

Type-species: *Aleyrodes comata* Maskell, 1896.

The transversely oval vasiform orifice of species included in this genus is quite distinctive. The lingula is broader than long, exposed by the very short operculum.

### ***Neomaskellia bergii*** (Signoret, 1868)

A pest of sugar cane in the tropics from Mauritius to the Pacific, this species is also to be found on other members of the Gramineae. It has been recorded from the upper reaches of the River Niger in West Africa by Mimeur (1946), and material in the British Museum has come from the following African territories; Gambia, Sierra Leone, Nigeria, Cameroons, Principe, São Thomé, Sudan, Uganda, Tanganyika, Malawi, and South Africa. In most cases the host is referred to as a grass, but material from Eastern Nigeria was collected on leaves of Raffia Palm.

At Ibadan, Nigeria, colonies of both nymphs and adults were observed on *Pennisetum purpureum* leaves protected by *Crematogaster sjostedti*. The ants had built tunnels of earth and plant fragments about one centimetre high and up to ten centimetres long over the colonies of whitefly, which they were apparently soliciting for honeydew. When the ants were prevented from reaching the whitefly, the honeydew accumulated on the leaves and these rapidly became covered by a black sooty mould.

## ***PEALIUS*** Quaintance & Baker, 1914

Type-species: *Aleyrodes maskellii* Bemis, 1904.

Species included in this genus have the floor of the vasiform orifice dissected by many ridges and the lingula exposed, usually with a D-shaped tip. The type-species *P. maskellii* has a series of fine sub-marginal setae and a crenulate margin from which the tracheal pore areas are not greatly differentiated. The two species described here may be separated as follows:

A. Orifice and eighth adominal setae in a cordate depression . . . . ***P. ezeigwi.***
B. Orifice and setae not so situated . . . . . . . . . ***P. fici.***

### ***Pealius fici* sp. n.**

(Text-figs. 46–48)

Pupal case: White, with a waxy palisade on leaf. Oval, rather tapered to posterior, widest across transverse moulting suture. Length 0·60 to 0·62 mm. Breadth 0·30 to 0·32 mm.

Margin: Smoothly crenulate, on hairy leaves extended vertically and deeply emarginate due to the proximity of leaf hairs during development. Thoracic tracheal pore areas indicated by slightly strengthened crenulations with a small lobe 5 μ long dorsally. Minute anterior and posterior marginal setae present.

Dorsal surface: Eight pairs of sub-marginal setae on both cephalothorax and abdomen. Fifth and seventh pair from anterior small, 5 μ, on hairy leaves first abdominal also small. Remaining setae up to 50 μ long, but on glabrous leaves only about 25 μ. On glabrous leaves sub-marginal setae in a single row, on hairy leaves (includes holotype) sixth and eighth from anterior often more or less on sub-dorsum, giving appearance of dorsal setae. All the setae on distinct tubercles. Paired dorsal setae on cephalic and eighth abdominal segments, the latter very small. Transverse moulting suture reaches margin, second abdominal suture bends to anterior. Anterior border of segment eight confluent with posterior border of segment six, apparently only seven segments in mid-line. Segmental tubercles weakly developed in sub-dorsal region. Paired sub-median depressions on anterior margin of meso- and metathorax, and abdominal segments one to six. Five similar depressions in cephalic region. Vasiform orifice almost semi-circular but widely open at posterior. Inner surface of orifice and caudal furrow dissected by anastomosing ridges. Operculum sub-rectangular, postero-lateral corners slightly elevated. Lingula exposed, D-shaped tip bears two proximal lobes.

Ventral surface : Thoracic tracheal folds not defined, anterior abdominal spiracles clear. No setae seen at base of legs. Antennae short with a narrow hooked tip.

Holotype pupal case. NIGERIA : Ibadan, Moor Plantation, *Ficus asperifolia*, 13.vii.1960 (*M. O. E.*).

Paratypes ; four pupal cases collected with the holotype ; twenty-eight pupal cases on *Ficus* sp., NIGERIA : Ibadan, 16.v.1956 (*V. F. E.*) ; four pupal cases on *Ficus asperifolia*, Agege near Lagos, viii.1960 (*M. O. E.*) ; fourteen pupal cases on *Ficus asperifolia*, Samaru near Zaria, x.1960 (*M. O. E.*).

The leaves of *Ficus asperifolia* are very hirsute, whereas the leaves of the plant recorded above as *Ficus* sp. are described in the collector's note-book as being completely smooth. At first sight the pupal cases from these two sources are quite different, but they are here considered to be conspecific for two reasons. Firstly because not all the specimens from hairy leaves have the sixth and eighth sub-marginal setae on the dorsum, and secondly because this type of variation of pupal cases, depending on the nature of the host plant, is quite widespread in the Aleyrodidae.

This species is closely related to *Pealius longspinus* Takahashi (1932) described from *Ficus beechyana* in Taipeh. This latter species differs in having several additional pairs of elongate sub-marginal setae; on the cephalo-thorax, one, three, six, and eight, and on the abdomen, two, three, six, seven and eight. In the paratypes of *P. longispinus* examined by the present author the eighth sub-marginal setae of the cephalo-thorax were not always as far dorsal in position as is indicated by the original figure. *Corbettella artocarpi* (Corbett, 1935*b*) is closely similar to the form of *P. fici* from glabrous leaves, but unfortunately the material referred to in that publication is not available.

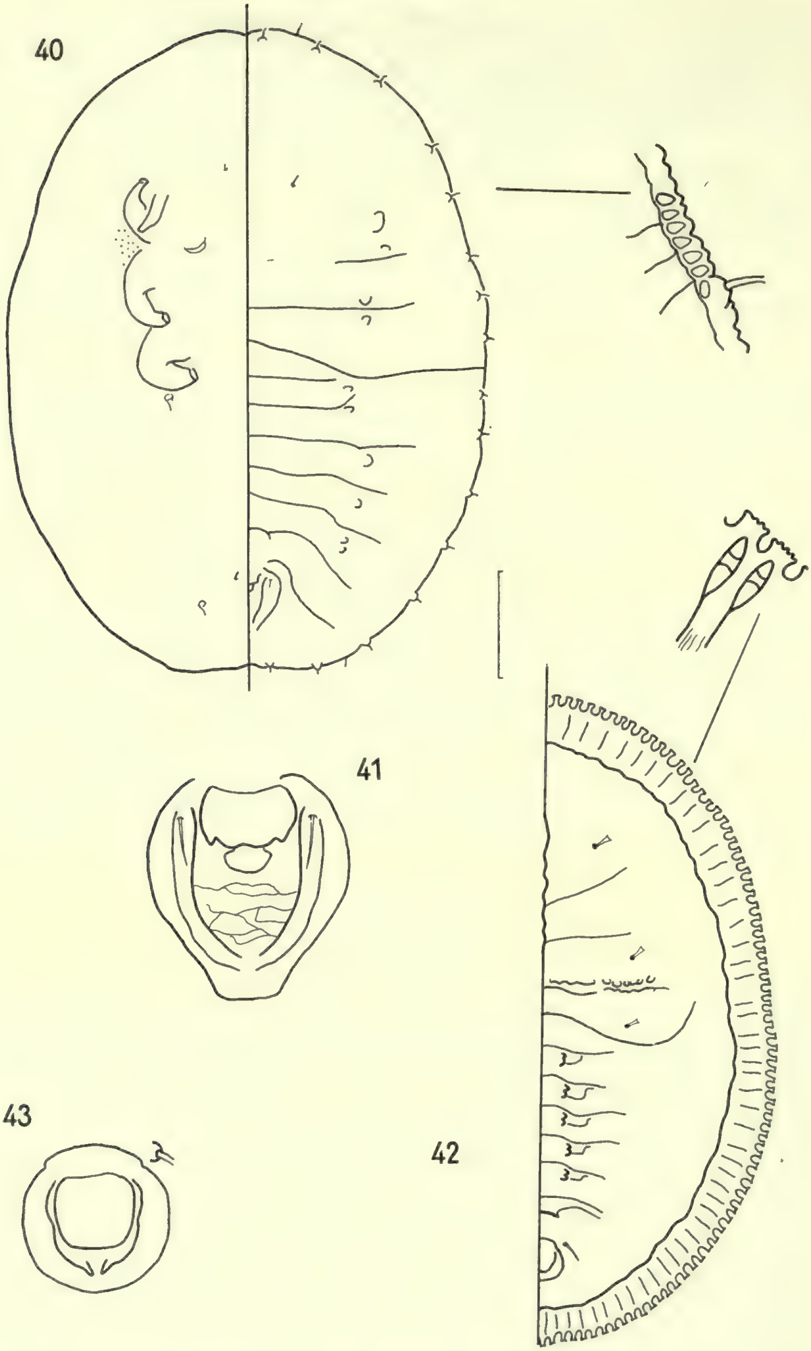
## ***Pealius ezeigwi* sp. n.**

(Text-figs. 40–41)

Pupal case : 0·70 × 0·50 mm. On the lower surface of leaves, white, with a little wax. Oval in shape, rather transverse at anterior and posterior, broadest across transverse moulting suture, barely constricted at thoracic pore.

Margin : Crenulate, but not regularly so (20 in 0·1 mm.). Anterior and posterior marginal setae present. Cephalo-thoracic sub-margin with eight pairs of setae on large setal bases, and abdomen with eight pairs including caudal setae. Thoracic tracheal pores indicated by slight constriction of pupal case and differentiation of marginal crenulations.

Dorsal surface : Flat, with no large setae, but with small cephalic and eighth abdominal setae. Sub-median area weakly defined by a series of segmentally arranged indistinct papillae. Segmental sutures extend into sub-dorsum. Transverse moulting suture reaches margin, dividing dorsum into equal anterior and posterior halves. Second abdominal suture bends to anterior almost meeting transverse moulting suture. Segment seven occluded in mid-line as anterior border of eight is confluent with posterior border of six. Vasiform orifice included within a cordate depression which also includes eighth abdominal setae. Depression longer than distance of orifice from posterior margin of body. Orifice roughly triangular, inner surface clearly dissec-



FIGS. 40–43. 40. *Pealius ezeigwi*—pupal case and detail of thoracic tracheal pore. 41. *P. ezeigwi*—vasiform orifice. 42. *Tetraleurodes ghesquierei*—pupal case and detail of margin. 43. *T. ghesquierei*—vasiform orifice.

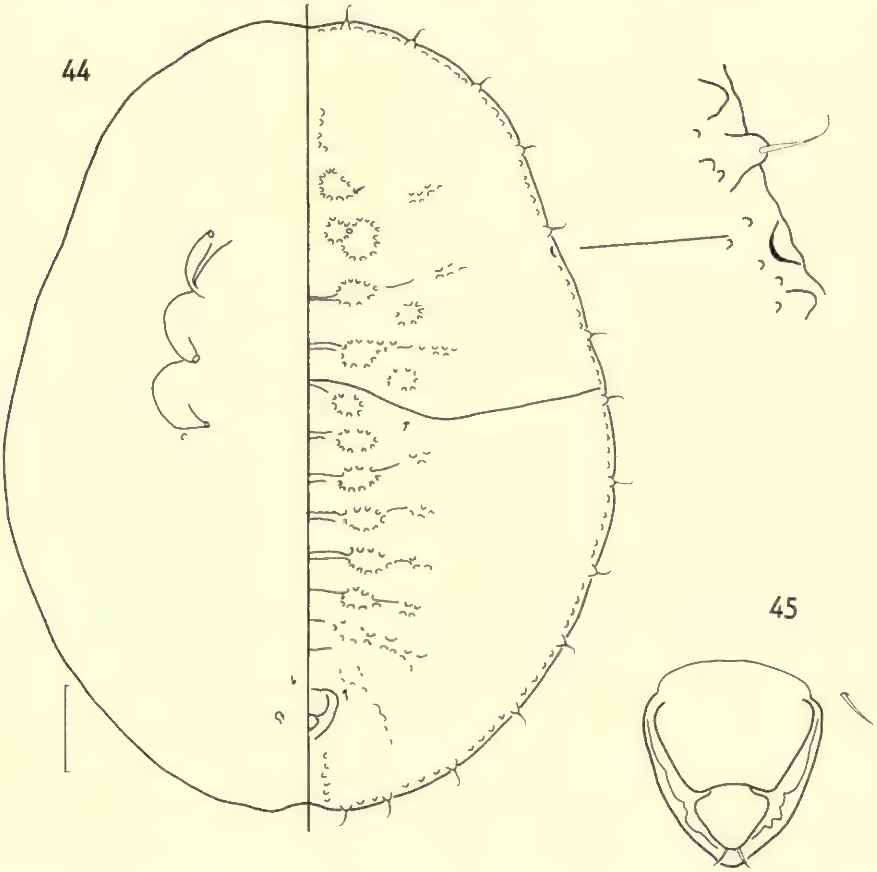
ted into small areas by ridges. Operculum rectangular, broader than long, postero-lateral corners pronounced, two pilose lobes on posterior border. Lingula short but exposed, D-shaped tip with two proximal papillae. Caudal furrow 0·04 mm.

Ventral surface : Thoracic tracheal folds indicated by minute dots. Anterior and posterior abdominal spiracles well developed. Small paired setae anterior to rostrum and posterior spiracles.

Holotype pupal case. NIGERIA : Ibadan, Bora Farm, Moor Plantation, on undetermined plant, vii.1960 (*M. O. E.*).

Paratypes ; five pupal cases, NIGERIA : Moor Plantation, Ibadan, on *Maesobotrya barteri* and *Alchornia cordifolia*, v, vi.1956 (*E. A. J.*).

This species shows similarities to *P. kelloggi* (Bemis) in its vasiform orifice, marginal setae, and long transverse moulting suture, but differs from that species in that the lingula is not narrowed to the tip. It differs from *P. misrae* Singh in the absence of dorsal setae on the thorax, and in the vasiform orifice being set in a depression.



FIGS. 44–45. 44. *Pogonaleyrodes zimmermanni*—pupal case and detail of thoracic pore. 45. *P. zimmermanni*—vasiform orifice.

## ***POGONALEYRODES*** Takahashi, 1955

Type-species: *Pogonaleyrodes fastuosa* Tak., 1955.

This was erected by Takahashi as a monotypic genus. The dorsal surface of the pupal case bears numerous tubercles arranged into a pattern of circles on the intersegmental sutures. The thoracic tracheal pores are rather ill-defined circular pores, and there is a well developed caudal furrow.

### ***Pogonaleyrodes zimmermanni*** (Newstead, 1911) **comb. n.**

(Text-figs. 44–45)

*Aleyrodes zimmermanni* Newstead, 1911.

Pupal case: 0·7 × 0·5 mm. to 0·9 × 0·6 mm. May occur on both lower and upper surfaces of leaves, occasionally on petioles. White, with a small waxy palisade. Oval to broadly oval in shape, widest across second abdominal segment. Slightly constricted at thoracic tracheal pores, rather more emarginate at posterior pore. Margin slightly thickened, appearing convex.

Margin: Vertical and palisade-like, appearing very finely irregular in mounted specimens. Paired anterior and posterior marginal setae small, ventral in mounted specimens and difficult to demonstrate. Cephalo-thoracic margin with six pairs of setae, abdomen with eight pairs, each mounted on a tubercle. These setae are hooked in mounted pupal cases, but may not be truly chitinous. Between each of the setal bases there are from four to eight similar but smaller tubercles. Typical caudal setae absent. Thoracic tracheal pores present as rather ill-defined circular pores.

Dorsal surface: With many papillae, forming distinctive pattern of circles on intersegmental sutures. About five papillae in posterior part of each circle, four in anterior part. A row of papillae along sixth and seventh abdominal sutures, and along anterior portion of longitudinal moulting suture. Similar papillae sometimes scattered throughout subdorsum. Simple pores on abdomen in four pairs of longitudinal rows. Small paired setae on cephalic, first, and eighth abdominal segments. Transverse moulting suture reaches margin, second abdominal suture curves forward. Seventh abdominal segment scarcely two-thirds length of six or eight which are sub-equal. Vasiform orifice cordate, the posterior lateral margins with a few teeth. Operculum broadly rectangular, rather more than half filling the orifice. Triangular knob of lingula exposed, included. Caudal furrow distinct, 0·05–0·08 mm.

Ventral surface: Tracheal folds not indicated. Anterior abdominal spiracle visible, no setae at base of legs. Fine paired setae antero-mesad of posterior abdominal spiracles. Antennae short and thin, with an elongate acute tip. Legs rather stout.

Material examined: Syntype series on leaves loaned from Humboldt University, Berlin. Two specimens were mounted and retained at the British Museum. Collection data; TANGANYIKA: Amani, on species of Acanthacae, ix. 1902 (*A. Zimmermann*).

Also collected in TANGANYIKA: South Highlands Province, on *Coffea arabica* at Tukuyu and Rungwe, xii. 1957 (*R. G. Tapley*). NIGERIA; Moor Plantation, Ibadan, on unknown plant, xi. 1959 and vii. 1960 (*E. A. J. & M. O. E.*).

This species was described in the genus *Aleyrodes* but was not recognizable from its description. It resembles Takahashi's figure of the type of *Pogonaleyrodes* from Madagascar in the form of the dorsal markings, the thoracic pores and the caudal furrow, but it differs in the absence of many small dorsal spines and the operculum not filling the orifice. Each pupal case of the type material is surrounded on the leaf by a number of eggs, but otherwise shows no differences from the other specimens listed above. The specimens from Coffee at Rungwe are remarkable in that some pupal cases were found living on the petioles of the leaves.

## *TETRALEURODES* Cockerell, 1902

Type-species : *Aleyrodes* (*Tetraleurodes*) *perileuca* Cockerell, 1902.

Pupal cases of species included in this genus have a strongly toothed margin with a vertical sculptured sub-margin elevating the dorsum. Marginal pores are well developed and the species are black in colour.

### *Tetraleurodes ghesquierei* Dozier, 1934

(Text-fig. 42)

Pupal case : Black, broadest across transverse moulting suture, dorsum elevated by vertical sub-margin.

Margin : Each marginal tooth expanded and rugose at tip with a large pore behind in sub-margin. Sub-margin vertical, strongly sculptured. Tracheal pore areas not differentiated, anterior and posterior marginal setae not seen.

Dorsal disc : Separated from sub-margin by fold, apparently flat. Transverse moulting suture almost meets first abdominal suture, then bends anteriorly to mesothorax. Mesothoracic suture with a row of broad teeth on both anterior and posterior borders. Longitudinal moulting suture not bordered by sculpturing. Prothoracic and cephalic segmental sutures clear, no cephalic tubercles. Abdominal sutures clear into sub-dorsum, segment six three times length of seven, and twice length of eight. Rhachis defined by two pairs of laterally directed teeth on abdominal segments two to six. Two rows of paired segmental pores, near rhachis and in sub-dorsum respectively. Large setal bases on cephalic, meso- and metathoracic segments bear short, colourless setae with expanded apices. Similar setal bases on eighth segment bear longer acutely tipped setae. Caudal setae very small, close together at edge of disc. Vasiform orifice sub-circular with a median internal projection at posterior margin, postero-lateral borders rugose internally. Operculum almost quadrate, lingula obscured. Short, broad, caudal furrow indicated.

Ventral surface : Obscured.

Material examined : Syntype ; one pupal case, CONGO : Barambu, on *Periploca nigrescens*, viii.1925 (*J. Ghesquière*).

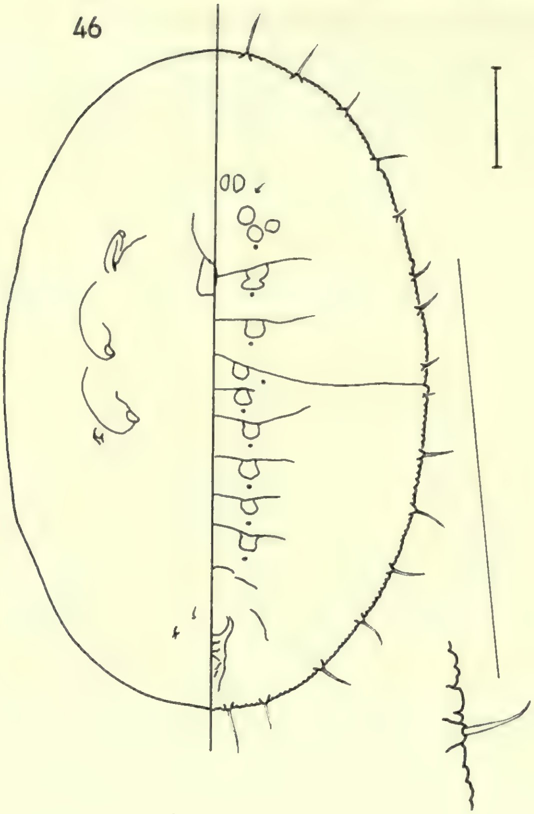
Five pupal cases, NIGERIA : Ibadan, on unknown plant, ii.1960 (*E. A. J.*).

This species is distinguished by the almost trumpet-shaped dorsal setae, and the absence of cephalic tubercles.

## *TRIALEURODES* Cockerell, 1902

Type-species : *Aleurodes pergandei* Quaintance, 1900.

The North American species of this genus have been revised by Russell (1948), but African and Oriental *Trialeurodes* species are very poorly known. The ventral surface of the mature pupa is usually swollen, elevating the dorsal surface from the leaf, and there is a vertical waxy palisade. Generally colourless and fragile, the most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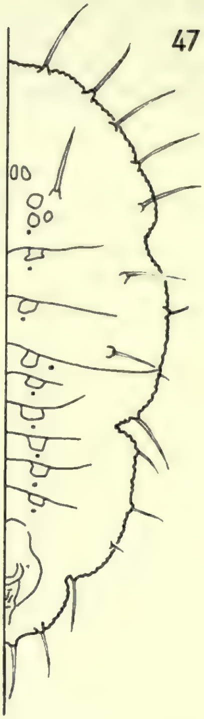
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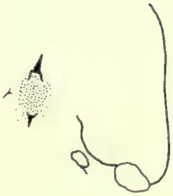
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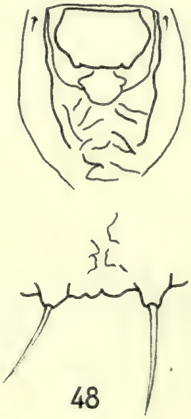
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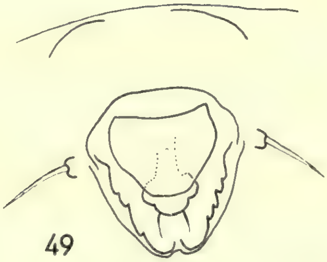
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FIGS. 46–50. 46. *Pealius fici*—pupal case from glabrous leaf. 47. *P. fici*—pupal case from hairy leaf. 48. *P. fici*—vasiform orifice and caudal margin. 49. *Trialeurodes desmodii*—vasiform orifice and sixth abdominal suture. 50. *T. desmodii*—mesothoracic leg, spiracle, and associated setae.

conspicuous characters are the sub-marginal papillae with wax secreting pores, and the trilobed lingula in the cordate orifice. The three species recorded from West Africa may be separated as follows:

| | | |
|---|---|---|
| A | Sub-marginal papillae all equal in size . . . . . . . . | ***T. ricini*** |
| B | Sub-marginal papillae not all equal in size . . . . . . . | ***T. desmodii*** |
| C | No true sub-marginal papillae, sub-margin with circular groups of pores . | ***T. hargreavesi*** |

### ***Trialeurodes desmodii*** Corbett, 1935

(Text-figs. 49–50)

*Trialeurodes lubia* El Khider & Khalifer, 1962. **syn. n.**

Pupal case : 0·50 × 0·30 mm. to 0·70 × 0·45 mm. Smaller specimens probably males, but small specimens also found on hairy leaves. White, with wax palisade and long marginal wax filaments. Elliptical in shape, occasionally on upper surface of leaves.

Margin : Irregularly crenulate (28 in 0·1 mm.). Posterior marginal setae almost 20 $\mu$ long, anterior marginal setae minute, 5 $\mu$ long. Thoracic tracheal pore area barely indicated, posterior pore composed of four or five strong crenulations.

Dorsal surface : Sub-margin with more than sixty papillae, usually between 68 and 72. On glabrous leaves papillae arranged in a single row, none on dorsum. On hairy leaves papillae apparently in two rows, also a pair of papillae on dorsum of cephalic, prothoracic and second abdominal segments. Sub-marginal disc pores mesad of papillae, caudal setae long, their bases distal to papillae. Transverse moulting suture ends almost opposite its midpoint. Anterior margin of abdominal segment eight confluent or almost confluent with posterior margin of segment six, segment seven thus occluded in mid-line. Paired short setae on cephalic, first and eighth abdominal segments, the latter rather more than half width of orifice in length, arising postero-laterally to anterior margin of operculum. Vasiform orifice cordate, length and breadth about equal, 50 $\mu$, anterior rim 10 $\mu$ long. Orifice emarginate at posterior, margins curve to anterior to meet an internal tooth. Internal lateral margins with fine teeth. Operculum fills two-thirds of orifice exposing tip and one pair of sub-apical lobes of lingula. Caudal furrow particularly developed on pupal cases from hairy leaves, 50 $\mu$ to 60 $\mu$.

Ventral surface : Meso- and metathoracic legs with two stout setae at base, one large (5 $\mu$) and one small, on a more heavily sclerotized area, just mesad of this a minute fine seta. Prothoracic leg with one stout seta. Anterior abdominal spiracles not seen.

Material examined : Syntypes ; two pupal cases, SIERRA LEONE : Njala, on *Desmodium lasiocarpum*, 13.xii.1932 (*E. Hargreaves*). Three paratypes of *T. lubia* with about fifty pupal cases from the type series of that species all bearing the same data, SUDAN : Shembat-Khartoum, on *Dolichos lablab* and various hosts, ix.1959 (*El Khidir*). NIGERIA : Ibadan, Moor Plantation, many specimens on *Desmodium lasiocarpum*, *Euphorbia heterophylla*, and *Corchorus* sp., iv–vi.1956 (*V. F. E. & E. A. J.*), also at the same site on *Dolichos*, vi.1929 (*F. D. Golding*).

This species does not fit into any of the North American species groups of *Trialeurodes* defined by Russell (1948). It was not recognizable from its original description and a relationship to *T. vaporariorum* had been tentatively suggested. It differs from that species in several important respects, notably the large setae at the base of the legs, the anterior rim of the orifice, and the relatively long operculum. The strong setae at the base of the legs are mentioned in the description of *T. lubia*, but the anterior rim around the vasiform orifice is confused in the figure of that species with the pockets of the eighth abdominal segment, and the internal opening of the orifice is apparently labelled as the operculum. The position of the sub-marginal disc pores relative to the sub-marginal papillae, a very useful character pointed out by Russell, was not indicated in the description of either species. *T. desmodii* is clearly widely distributed across Africa and the present author has recently received material apparently of this species from Bangalore, India. It seems possible that *T. rara* Singh (1931) may eventually be found to be an older name for this insect, but the Indian Collection is not available.

### ***Trialeurodes hargreavesi*** Corbett, 1935

Material examined: Two pupal cases, the paratypes; SIERRA LEONE: Njala, on *Lindernia diffusa*, 19.xii.1932 (*E. Hargreaves*).

The paratypes of this species are too poor to attempt a redescription without additional material. The original figure does not agree completely with these two specimens, in particular the sub-marginal pores are arranged in quite distinct circular clusters involving from five to fifteen pores. The number varies in the two specimens, but more particularly, as Corbett figured, from anterior to posterior in the same specimen. Moreover the lingula tip is more rounded than the figure indicates and extends beyond the posterior margin of the orifice. The species is by no means a typical *Trialeurodes*, but is possibly related to the Indian species *T. breyniae* Singh (1931).*

### ***Trialeurodes ricini*** (Misra, 1924)

Material examined: One pupal case, NIGERIA: Ibadan, Moor Plantation, on *Ipomoea batata*, xii.1960 (*M. O. E.*); one pupal case, Akure, on a Labiate species, vii.1956 (*V. F. E.*).

The identity of this species is not known for certain as the Indian collection of Singh is not available. The two specimens referred to above are provisionally identified as *T. ricini* as they have a uniform row of equal sized sub-marginal papillae, each with a pore at its base. Apart from this they are clearly very closely related to *T. desmodii*, with which species they have many characters in common.

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*A recent examination of the type material of *Lipaleyrodes phyllanthi* Takahashi, 1962, from Madagascar, has confirmed that *T. hargreavesi* should be placed in the genus *Lipaleyrodes*.

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D. A. YOUNG

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BY

D. A. YOUNG

North Carolina State University, Raleigh, N.C., U.S.A.

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# CICADELLINE TYPES IN THE BRITISH MUSEUM (NATURAL HISTORY) (HOMOPTERA: CICADELLIDAE)[1]

*By* D. A. YOUNG[2]

## SYNOPSIS

This is written to stabilize the identities of a number of taxa of the subfamily Cicadellinae (until recently referred to as Tettigellinae) in the British Museum (Nat. Hist.). This is done in preparation for a revision of the genera of the subfamily now in preparation by the author.

THIS work was made possible by a leave of absence for research from North Carolina State University in Raleigh, and financial support from that institution and the National Science Foundation. I am indebted to Dr. W. E. China, Mr. R. J. Izzard and to Mr. J. P. Doncaster of the British Museum (Nat. Hist.) for their assistance in every way possible during my visit to their institution.

There follows a list of taxa arranged alphabetically by specific names. A specimen in each of these taxa has been labeled as holotype or lectotype, in the B.M. (N.H.), by the writer. The name of each taxon is followed by a comma (,) and a coded reference to the original description of the taxon. The code is the same as that used in Metcalf's *Bibliography of the Homoptera* or in his *Bibliography of the Cicadelloidea* (see " Literature Cited ", below), which may be consulted for full bibliographic citations. The coded reference is followed by a colon (:), after which is cited the page number of the original description. This is followed by a listing of the kind of type specimen at hand (unless otherwise indicated, lectotypes are those designated in the present publication). This is followed by a description of the label(s) borne by the specimen, each label being enclosed in quotation marks and the individual lines of the label(s) separated by a semicolon (;).

Unless otherwise indicated, the types in the following list agree with the original description. Illustrations and/or notes of the diagnostic characters of the taxa have been made and will be published later in the larger paper. Additional specimens other than the types have been frequently mentioned, with the idea that authors who might wish to borrow specimens might know of their existence. No effort has been made to list the total number of specimens in each taxon.

A very large percentage of the taxa described by Fowler in the Biologia Centrali-Americana bear a label which states : " B.C.A. Homopt. II " and the name of the taxon. In the interest of saving space, such labels are referred to hereinafter merely as " the B.C.A. label ".

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[2] Department of Entomology, North Carolina State University at Raleigh, North Carolina, U.S.A.

It was possible, in the case of a number of species of Francis Walker, to label one of the specimens of the type series as " holotype " because of Walker's early practice (abandoned by him later) in which he cited his specimens " *a, b, c* " etc. in the original description. A description in which " *a* " alone appeared is regarded as sufficient grounds for designating a holotype, if the specimen can be located.

Concerning the references, below, to the coloured illustrations of Signoret and Fowler, it should be stated that the method of colour printing was not adequate for uniform reproduction. The remarks apply to comparisons made with the copies available to the present writer—good reproductions in the case of Signoret's work ; mediocre in the case of the Fowler species.

***acuta, Tettigonia*** Walker, 1851b : 773. Lectotype ♀ with labels : " Type " and " 103. Tettigonia acuta.". It agrees with the interpretation of Young and Davidson (1959a : 19).

***addita, Tettigonia*** Walker, 1851b : 737. Lectotype with abdomen and legs missing, with labels : " Type " and " 26. Tettigonia addita." and " Java ". This was the only specimen found, of the original four specimens. It agrees with the original description except that the black spot at the base of the face is obscure.

***admittens, Proconia*** Walker, 1858 : 227. Lectotype ♀ with labels : " Type " and " Proconia admittens." and " Mex.". The original description is very poor.

***aemilia, Aulacizes*** Distant, 1908b : 75. Lectotype ♀ with labels : " Type " and " Aulacizes ; aemilia ; type Dist." and " Bolivia. ; Toungas de la Paz. ; 1903–188.". This is the only specimen in the collection.

***aequa, Tettigonia*** Fowler, 1900b : 265. Lectotype ♂ with labels : " Type " and " Tettigonia ; aequa. Fowler. ; TYPE " and " Cuernavaca, ; Morelos. ; June, H. H. S." and the B. C. A. label. The original description was not precise, and the original illustration less so.

***aestuans, Tettigonia*** Walker, 1851b : 750. Lectotype ♀ with labels : " Type " and " 54. Tettigonia aestuans." and " W. Coast ; of ; America ". One of the fore wings is missing. It agrees fairly well with Signoret's illustration (1853b : plate 8, fig. 9), except that the non-black portions of the crown and pronotum are burnt orange in colour.

***affinis, Tettigoniella*** Distant, 1908g : 206. Lectotype with abdomen missing, with labels : " Type ; H. T." and " affinis ; type Dist." and " Assam ; Margherita " and " Distant Coll. ; 1911–383.".

***alalia, Aulacizes*** Distant, 1908b : 76. Lectotype ♀ with labels : " Type " and " Aulacizes ; alalia ; type Dist." and " Bolivia ; Toungas de la Paz. ; 1903–188.".

***albicans, Tettigonia*** Walker, 1858b : 214. Holotype ♀ with labels : " Type " and " albicans " and " Braz. ; Santarem " and " T. albicans ; TYPE Walk.".

***albiceps, Tettigonia*** Fowler, 1900b : 265. Lectotype ♀ with labels : " Type " and " Tettigonia ; albiceps. Fowler ; TYPE." and " Bugaba, ; Panama. ; Champion." and the B.C.A. label. This is the only specimen in the collection. The original illustration is not very good.

***albida, Tettigonia*** Walker, 1851b : 767. Holotype with abdominal apex missing, with labels : " Type " and " 91. Tettigonia albida." and " Port Natal ".

***albida, Tettigonia*** Walker, 1851b : 777. Holotype ♀ with labels : " Type " and " 112. Tettigonia albida." and " Mexico ".

***albidicans, Tettigonia*** Walker, 1858a : 96. Lectotype ♀ with labels : " Type " and " albidicans Walk " and " Sylhet " and " 68.4 ". This is the only specimen in the collection.

***albidipennis, Aulacizes*** Fowler, 1899a : 217. Lectotype ♀ with labels : " Type " and " Aulacizes ; albidipennis. Fowler. ; TYPE." and " Tierra Colorada ; Guerrero, 2,000 ft. ; Oct. H. H. Smith " and the B.C.A. label. The specimen is teneral. The markings of the anterior portion of the pronotum are smaller and more numerous than in the original illustration.

***albidonotata, Tettigonia*** Fowler, 1899e : 250. Lectotype ♂ with labels : " Type " and " Tettigonia ; albidonotata Fowler. ; TYPE." and " Bugaba, ; Panama. ; Champion." and the B.C.A. label. The portion of the original description concerning " minute white scales " is inaccurate.

***albidula, Tettigonia*** Walker, 1870b : 305. Lectotype ♂ with labels : " Type " and " albidula " and " 68.4 " and " N. Gui ; Wallace " and " N ".

***albigutta, Tettigonia*** Walker, 1851b : 753. Holotype ♀ with labels : " Type " and " 61. Tettigonia albigutta.". Signoret's illustration (1853b, pl. 9, fig. 6) was fairly accurate.

***albofasciata, Tettigonia*** Walker, 1851b : 756. Holotype ♂ with labels : " Type " and " 89. Tettigonia albofasciata." and " S. americ ". This is the only specimen in the collection.

***albomaculata, Tettigonia*** Distant, 1879b : 62. Lectotype ♀ with labels : " Type ; H. T." and " albomaculata ; type Dist." and " R. Susio. ; Costa Rica. ; H. Rogers." and " Distant Coll. ; 1911–383.". The original description erroneously specified a transverse fascia at the apex of the fore wings. The fascia is actually at the base of the fore wings.

***alcmena, Tettigoniella*** Distant, 1908g : 219. Lectotype ♂ with labels : " Type ; H. T." and " Tettigoniella ; alcmena ; type ; Dist." and " Margherita ; Assam " and " Distant Coll. ; 1911–383.". The specimen had been damaged by mould.

***alpha, Oncometopia*** Fowler, 1899b : 232. Lectotype ♂ with labels : " Type " and " Oncometopia ; alpha. Fowler. ; TYPE." and " O. undata ♂ ; var. or sp. n." and " Ciudad, Mex. ; 8100 ft. ; Forrer." and the B.C.A. label.

***amalda, Apulia*** Distant, 1908a : 527. Lectotype ♀ with labels : " Type " and " Apulia ; amalda ; type ; Dist." and " Kew ; Granada ".

***amalthea, Tettigoniella*** Distant, 1908g : 212. Lectotype ♀ with labels : " Type ; H. T." and " amalthea ; type Dist." and " Maskeliya, ; Ceylon. ; August." and " Distant Coll. ; 1911–383.".

***amida, Amblydisca*** Distant, 1908b : 70. Lectotype ♂ with labels : " Type " and " Amblydisca ; amida ; type Dist." and " Cachabé, ; low c., XI. 96. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.". There are three other specimens in the collection, a teneral ♂ and two ♀.

**amoena, Tettigonia** Walker, 1851b : 759. Lectotype ♀ with labels: "Type" and "73. Tettigonia amoena." and "Vene- ; zuela". The original description is very poor in that the specimen (which is teneral) is not black and the markings of the crown are not united on the face. There is one additional teneral ♀ in the collection.

**amulae, Tettigonia** Fowler, 1899e : 252. Lectotype ♀ with labels: "Type" and "Tettigonia ; amulae Fowler. ; TYPE." and "Amula, ; Guerrero, ; 6000 ft. ; Sept. H. H. Smith.". The specimen is teneral. It agrees with the original description except that there is no central line on the pronotum and the form is not robust. There are two additional teneral ♀ in the collection.

**anceps, Oncometopia** Fowler, 1899c : 234. Lectotype ♀ with labels: "Type" and "Oncometopia ; anceps Fowler. ; TYPE." and "Las Mercedes, ; 3000 ft. ; Champion." and the B.C.A. label. There is an additional ♂ in the collection.

**anceps, Tettigonia** Fowler, 1900c : 279. Lectotype ♂ with labels: "Type" and "T. anceps ; Fowler. TYPE." and "Bugaba, ; 800–1,500 ft. ; Champion.". The lectotype is the specimen behind which I placed a red mark. It is glued to a card which bears three additional specimens. The original illustration is not very good.

**angularis, Tettigonia** Walker, 1857b : 167. Lectotype ♀ with labels: "Type" and "angularis Walk" and "Sar." and "Wallace" and "68.4."

**angulifera, Tettigonia** Walker, 1851b : 771. Lectotype ♀ with labels: "Type" and "99. Tettigonia angulifera." and "N-f-dland.". It agrees with Young and Davidson's recent interpretation (1959a : 7).

**angustula, Tettigonia** Fowler, 1900d : 291. Lectotype ♀ with labels: "Type" and "T. angustula ; Fowler" and "Xucumanatlan, ; Guerrero. ; 7000 ft. ; July. H. H. Smith." and the B.C.A. label. The lectotype, behind which I placed a red mark, is one of two ♀ on the same card. The lectotype is darker than originally illustrated.

**angustula** var. **immaculata, Tettigonia** Fowler, 1900d : 292. Lectotype ♂ with labels: "Type" and "T. angustula ; v. immaculata ; Fowler. TYPE." and "Amula, ; Guerrero, 6000 ft. ; Aug. H. H. Smith." and the B.C.A. label. Three ♂ are incorrectly associated with the lectotype.

**angustus, Rhaphirrhinus** Walker, 1851b : 806. Holotype ♂ with labels: "Type" and "5. Raphirhinus angustus." and "Ent. Club. ; 44–12."

**anita, Tettigonia** Fowler, 1900d : 281. Lectotype ♂ with labels: "Type" and "Tettigonia ; anita Fowler ; TYPE." and "Bugaba, ; Panama. ; Champion." and the B.C.A. label. I placed a red mark behind the lectotype, one of two specimens glued to the same card. There is an additional ♂ in the collection.

**annandalei, Tettigoniella** Distant, 1908f : 140. Lectotype ♀ with labels: "Type" and "Tettigoniella ; annandalei ; type Dist." and "Talum ; 19 [one digit obscured by pin-holes]02". The specimen is teneral and the hind legs are missing.

***annuligera, Proconia*** Walker, 1858b : 232. Holotype ♀ with labels : " Type " and " Proconia annuligera." and " Petropolis ; Feby. 1857. ; J. Gray.". This is the only specimen in the collection.

***antica, Tettigonia*** Walker, 1851b : 771. Holotype ♂ with labels : " Type " and " E. Doubleday. ; Trenton Falls, ; New York.". It agrees with the interpretation of Young and Davidson (1959a : 11).

***aphrophoroides, Tettigonia*** Fowler, 1899e : 250. Lectotype ♀ with labels : " Type." and " Tettigonia ; aphrophoroides ; Fowler. TYPE." and " Xucumanatlan, ; Guerrero, ; 7000 ft. ; July. H. H. Smith." and the B.C.A. label. It is the only one of the four (conspecific) specimens which agrees with the original illustration.

***apicalis, Tettigonia*** Walker, 1851b : 736. Lectotype ♂ with labels : " Type " and " 24. Tettigonia apicalis." and " China ".

***appropinquans, Tettigonia*** Fowler, 1899d : 247. Lectotype ♂ with labels : " Type " and " Tettigonia ; appropinquans ; Fowler. TYPE." and " Chilpancingo ; Guerrero, 4600 ft. ; June. H. H. Smith." and the B.C.A. label. The lectotype is one of a pair of specimens glued to the same card. The original description is poor.

***apulia, Tettigoniella*** Distant, 1908a : 523. Lectotype ♂ with labels : " Type " and " Tettigoniella ; apulia ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.". This is the only specimen in the collection.

***argentigutta, Tettigonia*** Walker, 1858b : 215. Holotype ♀ with labels : " Type " and " Tettigonia argentigutta." and " Constancia ; Jany 1857. ; J. Gray.".

***assamensis, Tettigonia*** Distant, 1880b : 203. Lectotype ♀ with labels : " Type ; H. T." and " assamensis ; (type) Dist " and " Assam " and " Distant Coll. ; 1911–383.". There is an additional ♂ in the collection.

***aterrima, Phera*** Fowler, 1899a : 224. Lectotype ♀ with labels : " Type " and " Phera ; aterrima. ; Fowler. TYPE." and " Tierra Colorada, ; Guerrero, ; 2,000 ft. ; Oct. H. H. Smith." and the B.C.A. label. It is the only specimen in the collection. Except that the crown is bluntly rounded and that the pronotum is distinctly rugose, the specimen agrees with the original description. The wing apices have been broken off.

***atomaria, Aulacizes*** Walker, 1851b : 792. Holotype ♂ with labels : " Type " and " 5. Aulacizes atomaria." and " 88 ; a ". The original description is not very good.

***atra, Proconia*** Walker, 1851b : 789. Lectotype ♂ with labels : " Type " and " 19. Proconia atra." and " Honduras ". This specimen had been studied by Dr. Heinz Schröder.

***atrata, Phera*** Fowler, 1899a : 222. Lectotype ♂ with labels : " Type " and " Phera atrata ; Fowler. TYPE " and " S. Geronimo, : Guatemala. ; Champion." and the B.C.A. label. The head is more produced and the colour is darker than in the original illustration. There is an additional ♂ topotype in the collection.

**atronotata, Kolla** Distant, 1918b : 10. Lectotype ♂ with labels : " Type " and " Kolla ; atronotata ; type Dist." and " Kodai Kanal ; S. India. Campbell." and " S. India ; E. A. Butler. ; 1915–60." and " 654 ". There are four additional specimens in the collection.

**attenuata, Tettigonia** Walker, 1851b : 766. Holotype specimen without abdomen, with labels : " Type " and " Hong Kong " and " Tettigonia attenuata."

**aulaeata, Amblydisca** Fowler, 1898a : 212. Lectotype ♀ with labels : "Type" and " Amblydisca ; auleata Fowler. ; TYPE." and " Chontales, ; Nicaragua. ; Janson." and the B.C.A. label. It agrees fairly well with the original illustration, but the markings of the crown are black, and the paler markings of the fore wings are flesh-colour. There is a teneral topotypic ♀ and another ♀ in the collection.

**auriculata, Kolla** Distant, 1920f : 470. Holotype ♀ with labels : " Type ; H. T." and " Kolla ; auriculata ; type Dist." and " U. Houadou R. ; New Caledonia ; 4.8.14. P.D.M.". and " New Caledonia. ; P. D. Montague. ; 1917–87 ". It is the only specimen in the collection.

**aurigena, Proconia** Walker, 1858b : 228. Holotype ♀ with labels : " Type " and " Proconia aurigena." and " Vera Cruz ".

**auriplena, Tettigonia** Walker, 1858b : 214. Holotype ♀ with labels : " Type " and " Tettigonia auriplena." and " Tejuca ; Jany 1857 ; J. Gray.". There is an additional ♂ in the collection.

**aurolineata, Tettigonia** Fowler, 1900d : 283. Lectotype ♀ with labels : " Type " and " Tettigonia ; aurolineata ; Fowler. TYPE." and " Chilpancingo, ; Guerrero, 4600 ft. ; June. H. H. Smith.". The lectotype is adjacent to a red mark I placed on the card to which two ♀ were glued. The markings are orange ; not orange-red as stated in the original description. There is also a ♂ in the collection.

**avella, Onega** Distant, 1908a : 528. Lectotype ♂ with labels : " Type " and " Onega ; avella ; type Dist." and " Cotypes, Breddin. ; Purch. of Haensch. ; Tettigonia ; spec. nov." and " Baiza ; (Ecuad.) ; R. Haensch S." and " 129 " and " 1903–322.". This is the only specimen in the collection. It agrees fairly well with the original description except that both clavus and corium are reticulate-veined.

**azeka, Tettigoniella** Distant, 1908a : 523. Lectotype ♂ with labels : " Type " and " Tettigoniella ; azeka ; type Dist." and " Peru. ; Rosenberg. ; 1906 ; 263.".

**badia, Proconia** Walker, 1851a : 786. Holotype ♀ with labels : " Type " and " 12. Proconia badia.".

**baluensis, Tettigoniella** Distant, 1908f : 141. Lectotype ♂ with labels : " Type " and " Tettigoniella ; baluensis ; type Dist." and " Kina Balu. ; 95–226.". It agrees fairly well with the original description, but the face is not flattened.

**basalis, Aulacizes** Walker, 1851b : 795. Holotype ♀ with labels : " Type " and " 11. Aulacizes basalis." and " Vene- ; zuela ". It is the only specimen in the collection. All but one of the legs are missing.

**basimacula, Tettigonia** Walker, 1851b : 746. Lectotype ♀ with labels : " Type " and " 46. Tettigonia basimacula." and " Tejuca ; Jany. 1857. ; J. Gray.". There is also a ♂ in the collection.

***batesi, Oncometopia*** Distant, 1908b : 62. Lectotype ♀ with labels : " Type " and " Oncometopia ; batesi Dist. ; type " and " Amaz " and " 68.4 ". It is the only specimen in the collection.

***bella, Tettigonia*** Walker, 1851b : 778. Holotype ♀ with labels : " Type " and " 114. Tettigonia bella." and " N. ; India ". There is a series of additional specimens of both sexes.

***bellona, Tettigoniella*** Distant, 1908g : 212. Lectotype ♀ with labels : " Type ; H. T." and " bellona ; type Dist." and " Ruby Mines ; (Doherty) " and " Distant Coll. ; 1911–383.". There is also a ♂ in the collection.

***bifacies, Tettigonia*** Walker, 1858b : 213. Lectotype ♀ with labels : " Type " and " Tettigonia bifacies." and " Tejuca ; Jany 1857. ; H. Clark.". It is the only specimen in the collection.

***bilineata, Tettigonia*** Fowler, 1900a : 257. Lectotype ♂ with labels : " Type " and " Tettigonia ; bilineata ; Fowler. TYPE " and " Rincon, ; Guerrero, ; 2800 ft. ; Oct. H. H. Smith." and the B.C.A. label. It disagrees with the original illustration in that the anterior margin of the head is not semi-circular. There are several additional specimens in the collection.

***biolleyi, Diestostemma*** Distant, 1908b : 81. Lectotype ♂ with labels : " Type ; H. T." and " Diestostemma ; biolleyi ; type Dist." and " Cervantes 174 ; (Atl.) 1400 m. ; V 1906. ; P. Biolley ". There is an additional ♂ in the collection.

***boliviana, Trichogonia*** Distant, 1908a : 515. Lectotype ♂ with labels : " Type " and " Trichogonia ; boliviana ; type Dist." and " Bolivia. ; Toungas de la Paz. ; 1903–188.".

***brasiliensis, Oncometopia*** Distant, 1908b : 65. Holotype ♀ with labels : " Type " and " Oncometopia ; braziliensis ; type Dist." and " Braz." and " 68.4 ".

***brevifrons, Tettigonia*** Walker, 1851b : 754. Holotype specimen without abdomen, with labels : " Type " and " 63. Tettigonia brevifrons." and " Java ".

***brevis, Rhaphirrhinus*** Walker, 1851b : 807. Lectotype ♀ with labels : " Type " and " 7. Rhaphirhinus brevis." and " Venezu ".

***bugabensis, Amblydisca*** Fowler, 1898a : 210. Lectotype ♀ with labels : " Type " and " Amblydisca ; bugabensis ; Fowler. TYPE " and " Bugaba, ; 800–1,500 ft. ; Champion." and the B.C.A. label. The specimen agrees with the original description and illustration but is smaller than indicated in the latter. There is an additional ♂ in the collection.

***burmanica, Apphia*** Distant, 1918b : 5. Lectotype ♀ with labels : " Type ; H. T." and " Apphia ; burmanica ; type Dist." and " U. Burma ; Maymyo, 3500 ft. ; 19–21 VIII 14 ; Fletcher coll " and " Pusa coll." and " Pusa coll. ; 1915–164.". It is the only specimen in the collection.

***butleri, Faenius*** Distant, 1918b : 15. Lectotype ♀ with labels : " Type " and " Faenius ; butleri ; type Dist." and " Kodai Kanal. ; S. India. ; T. V. Campbell." and " 539 " and " S. India. ; E. A. Butler. ; 1915–60.". There is one additional specimen in the collection.

***cachabensis, Tettigoniella*** Distant, 1908a : 517. Lectotype ♀ with labels : " Type " and " Amblyscarta cachabensis ; type Dist." and " Cachabe, ; low c., XI.96. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.". There is an additional ♂ in the collection.

***caicus, Tettigonia*** Walker, 1862a : 318. Lectotype ♀ with labels : " Type " and " Tettigonia ; caicus ; type Walk " and " Ciccus ; sp. ig." and " Rio " and " Miss Pascoe. ; 69–41.". It is the only specimen with typical data in the collection.

***candida, Tettigonia*** Walker, 1858b : 195. Holotype ♀ with labels : " Type " and " Tettigonia candida." and " Mex."

***candidipes, Tettigonia*** Walker, 1858b : 219. Lectotype ♂ with labels : " Type " and " Tettigonia candidipes." and " N. China. ; 54.8.". This is the only specimen in the collection.

***canidia, Kolla*** Distant, 1908g : 226. Holotype ♂ with labels : " Type ; H. T." and " Kolla ; canidia ; type Dist." and " Sikkim " and " Distant Coll. ; 1911–383.". This is the only specimen in the collection.

***capito, Oncometopia*** Distant, 1908b : 66. Lectotype ♀ with labels : " Type " and " Oncometopia ; capito ; type ; Dist." and " Theresopolis ; 88–137.".

***cara, Tettigonia*** Walker, 1851b : 755. Holotype ♀ with labels : " Type " and " Java ; 46 108 ". The abdomen is compressed and distorted. The pronotum is perforated by a pin hole and the head is partly detached from the pronotum.

***carissima, Tettigonia*** Fowler, 1900c : 280. Lectotype ♂ with labels : " Type " and " Tettigonia carissima ; Fowl. TYPE." and " Bugaba, ; Panama. ; Champion." and the B.C.A. label. The lectotype is one of two specimens glued to the same card, and is adjacent to the red mark I placed on the card. There are no additional specimens in the collection.

***caudata, Tettigonia*** Walker, 1851b : 749. Holotype ♂ with labels : " Type " and " 51. Tettigonia caudata." and " Bolivia ; E. Doubleday ". This is the only specimen in the collection.

***cephalotes, Tettigonia*** Walker, 1851b : 759. Holotype specimen without abdomen, with labels : " Tettigonia cephalotes " and " B. Guiana " and " Type ".

***cervina, Tettigonia*** Fowler, 1899e : 250. Lectotype ♂ with labels : " Type " and " Tettigonia ; cervina. Fowler. TYPE." and " Cerro Zunil ; 4000 ft. ; Champion.". The lectotype is one of a pair of specimens glued to the same card and adjacent to the red mark I placed on the card.

***chiriquensis, Tettigonia*** Fowler, 1899c : 237. Lectotype ♂ with labels : " Type " and " Tettigonia ; chiriquensis. ; Fowler. TYPE." and " V. de Chiriqui, ; 2–3000 ft. ; Champion." and the B.C.A. label. The head is more strongly produced than in the original illustration.

***cinctipes, Ciccus*** Walker, 1851b : 803. Holotype ♂ with labels : " Type " and " 13. Ciccus cinctipes." and " Brazil ".

***cirta, Amblydisca*** Distant, 1908b : 70. Lectotype ♀ with labels : " Type " and " Amblydisca ; cirta ; type Dist." and " Cuenca ".

**civilis, Tettigonia** Fowler, 1900b : 272. Lectotype ♀ with labels : " Type " and " Tettigonia ; civilis Fowler. ; TYPE " and " Omilteme, ; Guerrero, 8000 ft. ; July. H. H. Smith." and the B.C.A. label. The original illustration is not very accurate for the fine shades of colour of this specimen.

**clarior, Proconia** Walker, 1851b : 784. Lectotype ♂ with labels : " Type " and " 9. Proconia clarior.". This specimen had been studied by Dr. Heinz Schröder.

**cleasa, Aulacizes** Distant, 1908b : 75. Lectotype ♀ with labels : " Type " and " Aulacizes ; cleasa ; type Dist." and " Bolivia. ; J. Steinbach. ; 1904–311.".

**cleora, Diedrocephala** Distant, 1908b : 59. Lectotype ♂ with labels : " Type " and " Diedrocephala ; cleora ; type Dist." and " Cachabé ; low c., XI. 96. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.".

**clepsydra, Tettigonia** Fowler, 1900b : 270. Lectotype ♀ with labels : " Type " and " Tettigonia ; clepsydra ; Fowler. TYPE " and " Cerro Zunil, ; 4–5000 ft. ; Champion." and the B.C.A. label.

**coccinea, Tettigonia** Fowler, 1900a : 263. Lectotype ♀ with labels : " Type " and " Atoyac, ; Vera Cruz. ; May. H. H. S." and " Tettigonia ; coccinea ; Fowler. TYPE ". There are two additional ♀ in the collection.

**coeruleovittata** var. **delineata, Tettigonia** Fowler, 1900c : 277. Lectotype ♀ with labels : " Type " and " Tettigonia ; coeruleovittata ; var. delineata ; Fowler TYPE " and " Chilpancingo, ; Guerrero, ; 4600 ft. ; Sept. H. H. Smith." and the B.C.A. label. The lectotype, one of two ♀ glued to the same card, is adjacent to the red mark I placed on the card.

**collata, Tettigonia** Fowler, 1900a : 261. Lectotype ♀ with labels : " Type " and " T. collata ; Fowler. Type." and " V. de Chiriqui, ; 25–4000 ft. ; Champion." and the B.C.A. label. There are four additional ♀ in the collection.

**completa, Tettigonia** Fowler, 1900b : 268. Lectotype ♀ with labels : " Type " and " Tettigonia ; completa ; Fowler. TYPE " and " Chilpancingo, ; Guerrero, 4600 ft. ; June. H. H. Smith."

**composita, Tettigonia** Fowler, 1900c : 277. Holotype ♀ with labels " Type " and " Tettigonia ; composita ; Fowler. TYPE." and " Cerro Zunil, ; 4–5000 ft. ; Champion." and the B.C.A. label. The original description is poor.

**compressa, Propetes** Walker, 1851b : 797. Holotype ♀ with labels : " Type " and " 1. Propetes compressa." and " Para " and " 294 ".

**compta, Tettigonia** Fowler, 1900b : 271. Lectotype ♂ with labels : " Type " and " Tettigonia ; compta Fowler ; TYPE " and " Cuernavaca, ; Morelos. ; June H. H. S." and the B.C.A. label. The lectotype, one of two ♂ specimens glued to the same card, is adjacent to the red mark I placed on the card.

**concinna, Tettigonia** Walker, 1851b : 755. Holotype ♀ with labels : " Type " and " 65. Tettigonia concinna." and an illegible label consisting of two characters. Both fore wings are missing.

**concinnula, Tettigonia** Fowler, 1900d : 287. Lectotype ♂ with labels : " Type " and " Tettigonia ; concinnula ; Fowler. TYPE " and " Omilteme. ; Guerrero, 8000 ft. ; July. H. H. Smith." and the B.C.A. label.

***configurata, Tettigonia*** Walker, 1858b : 216. Lectotype specimen without abdomen, with labels : " Type " and " Tettigonia configurata." and " Para ". The original description of the fore wings is poor.

***confinis, Tettigonia*** Walker, 1851b : 745. Holotype ♀ with labels : " Type " and " 44. Tettigonia confinis." and " 161 " and " 376 ".

***confinis, Tettigonia*** Walker, 1851b : 736. Lectotype ♂ with labels : " Type " and " 25. Tettigonia confinis." and " Canton ".

***congruens, Tettigonia*** Fowler, 1899e : 252. Lectotype ♂ with labels : " Type " and " Tettigonia ; congruens ; Fowler, TYPE." and " V. de Chiriqui ; 4000–6000 ft. ; Champion." and the B.C.A. label. There is one additional ♂ in the collection.

***consistens, Proconia*** Walker, 1858b : 226. Holotype ♂ with labels : " Type " and " Proconia consistens." and " Mex."

***consobrina, Tettigonia*** Fowler, 1899d : 245. Lectotype ♂ with labels : " Type " and " Tettigonia ; consobrina ; Fowler. TYPE " and " Cerro Zunil ; 4000 ft. ; Champion." and the B.C.A. label. The lectotype is the ♂ of a pair of specimens glued to the same card and is adjacent to a red mark I placed on the card.

***consors, Ujna*** Distant, 1908g : 240. Holotype ♂ with labels " Type ; H. T." and " Ujna ; consors ; type Dist." and " Myitta ; Doherty " and " Distant Coll. ; 1911–383."

***conspersa, Aulacizes*** Walker, 1851b : 792. Lectotype ♀ with labels : " Type " and " 6. Aulacizes conspersa." and " 613 " and " not ; Aulacizes ". The specimen is teneral.

***conspissata, Tettigonia*** Fowler, 1899d : 241. Lectotype ♀ with labels " Type " and "T. conspissata ; Fowler" : and "Senahu, ; Vera Paz. ; Champion." and the B.C.A. label. The marking near the anterior margin of the head is darker than in the original illustration.

***constans, Tettigonia*** Walker, 1858b : 198. Holotype ♂ with labels : " Type " and " Tettigonia constans." It is the only specimen in the collection.

***corixoides, Tettigonia*** Fowler, 1899c : 240. Lectotype ♀ with labels : " Type " and " Tettigonia ; corixoides. Fowler. ; TYPE " and " Bugaba, ; 800–1,500 ft. ; Champion." and the B.C.A. label. The original illustration is poor. There is one additional specimen in the collection.

***cornelia, Tettigoniella*** Distant, 1908a : 521. Lectotype ♂ with labels : " Type " and " Tettigoniella ; cornelia ; type Dist." and " Peru. ; Rosenberg. ; 1906–263 ".

***cornelia, Tettigoniella*** Distant, 1908g : 209. Lectotype ♀ with labels : " Type ; H. T." and " Cornelia. ; type Dist." and " Myitta ; Doherty " and " Distant Coll. ; 1911–383."

***costaricensis, Tettigonia*** Distant, 1879b : 63. Lectotype ♀ with labels : " Type ; H. T." and " costaricen- ; sis Dist. ; (type) " and " Costa Rica. ; R. Suslo. ; H. Rogers." and " Distant Coll. ; 1911–383.".

***crassa, Tettigonia*** Walker, 1851b : 762. Lectotype specimen without abdomen, with labels : " Type " and " 79. Tettigonia crassa." and " Colum- ; bia ". It agrees with the original description, except that Walker apparently twice described a pair of spots on the crown of the head. There are three spots on the crown.

**cumatilis, Tettigoniella** Distant, 1908f : 138. Lectotype ♀ with labels : " Type " and " Tettigoniella ; cumatilis ; type Dist." and " Kinta Valley, ; S. Perak. ; Sept.-Oct. ; H. N. Ridley. ; 1900–81.".

**cyanescens, Tettigonia** Walker, 1851b : 760. Holotype ♂ with labels : " Type " and " 76. Tettigonia cyanescens." and " Vene ; zuela ".

**daeta, Tettigoniella** Distant, 1908a : 522. Lectotype ♂ with labels : " Type " and " Tettigoniella ; daeta ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.". This is the only specimen in the collection.

**decora, Tettigonia** Walker, 1851b : 744. Holotype ♀ with labels : " Type " and " 41. Tettigonia decora." and " Ega, Brazil ".

**decorata, Tettigonia** Walker. 1851b : 761. Lectotype ♀ with labels : " Type " and " 77. Tettigonia decorata." and " 46 ; 62 ". The original description is not accurate for the clypellus (" epistoma ") nor for the fore wings. There is an additional ♀ in the collection.

**delicata, Tettigonia** Fowler, 1900b : 269. Lectotype ♀ with labels : " Type " and " Tettigonia ; delicata. Fowler. ; TYPE " and " Chilpancingo, ; Guerrero ; 4600 ft. ; June. H. H. Smith." and the B.C.A. label. The lectotype is adjacent to the red mark I placed on a card bearing two ♀ of this species. The lines on the wings are maroon.

**delicatula, Ujna** Distant, 1908g : 239. Holotype ♀ with labels : " Type ; H. T." and " Ujna ; delicatula ; type Dist." and " Peradeniya ; Ceylon, 4–05 " and " Distant Coll. ; 1911–383.". It is more slender than in the original illustration.

**detrahens, Tettigonia** Walker, 1858b : 196. Holotype specimen without abdomen, with labels : " Type " and " Tettigonia detrahens. " and " Mexico ". It agrees with the original description except for the thorax which is quite clearly marked.

**dilecta, Tettigonia** Walker, 1851b : 747. Holotype ♂ with labels : " Type " and " 48. Tettigonia dilecta." and " Ega ; Brazil ". The original description is very poor. There is a large red spot astride the jugal fold in its basal half.

**detracta, Tettigonia** Fowler, 1900a : 258. Lectotype ♂ with labels : " Type " and " Tettigonia ; detracta. Fowler. ; TYPE " and " Bugaba, ; Panama. ; Champion." and the B.C.A. label.

**diaphana, Kolla** Distant, 1918b : 9. Lectotype ♀ with labels : " Type " and " Kolla ; diaphana ; type Dist." and " Kodai Kanal ; S. India. Campbell." and " 684 " and " S. India. ; E. A. Butler. ; 1915–60." and " =teneral spec ; of ganessa.". It is teneral, and the only specimen in the collection.

**diducta, Tettigonia** Fowler, 1900c : 274. Lectotype ♂ with labels : " Type " and " Tettigonia ; diducta. Fowler. ; TYPE." and " Amula, ; Guerrero, 6000 ft.; Aug. H. H. Smith." and the B.C.A. label. It agrees with the original description but not with the original illustration, which is poor.

**diminutus, Ciccus** Walker, 1861b : 801. Holotype ♂ with labels : " Type " and " 9. Ciccus diminutus." and " 609 " and " Brazil ". The holotype does not agree very well with the original description.

**discrepans, Tettigonia** Walker, 1858b : 212. Lectotype ♀ with labels : " Type " and " Tettigonia discrepans." and " Constancia ; Jany. 1857. ; J. Gray.".

***dispar, Oncometopia*** Fowler, 1899b : 229. Lectotype ♂ with labels : " Type " and " Oncometopia ; dispar. Fowler ; TYPE ♂ " and " Sabo, ; Vera Paz. ; Champion " and the B.C.A. label. The spots of the fore wing are purplish, as in the original illustration, not as in the original description.

***distinguenda, Tettigonia*** Fowler, 1900a : 257. Lectotype ♀ with labels : " Type " and " Tettigonia ; distinguenda Fowler. ; TYPE " and " Panama ; Boucard." and the B.C.A. label. This is the only specimen in the collection.

***dives, Aulacizes*** Walker, 1851b : 791. Holotype ♂ with labels : " Type " and " 3. Aulacizes dives.".

***dorsicrista, Germaria*** Walker, 1858a : 97. Lectotype ♀ with labels : " Type " and " dorsicrista Walk " and " Amaz " and " 68.4 ". The spots of the thorax are not connected as stated in the original description.

***dorsivitta, Ciccus*** Walker, 1851b : 802. Holotype ♂ with labels : " Type " and " 10. Ciccus dorsivitta." and " Para ".

***drusilla, Abana*** Distant, 1908b : 73. Lectotype ♀ with labels : " Type " and " Abana ; drusilla ; type Dist." and " Cachabé, low c. I. 97. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.". The specimen is teneral.

***dunsiriensis, Tettigoniella*** Distant, 1908g : 214. Lectotype ♂ with labels : " Type ; H. T." and " dunsiriensis ; type Dist." and " Dunsiri Valley ; Major S-A " and " Distant Coll. ; 1911–383.". The original description is not very good. The fore wings are missing from the lectotype, the only specimen in the collection.

***duplicaria, Tettigonia*** Distant, 1891d : 120, and 1893a : 96. Lectotype ♂ with labels : " Type ; H. T." and " duplicaria ; Dist." and " Machachi, ; Ecuador. ; 9–10,000 feet. ; Ed Whymper." and " Distant Coll. ; 1911–383." There are several additional specimens in the collection.

***eburnea, Tettigonia*** Walker, 1857b : 168. Lectotype ♂ with labels : " Type " and " eburnea Walk " and " SAR " and " Wallace ".

***eliyana, Kolla*** Distant, 1918b : 10. Lectotype ♂ with labels : " Type " and " Kolla ; eliyana ; type Dist." and " Nuwara Eliya, ; Ceylon, III–1911 " and " Ceylon. ; T. B. Fletcher. 1909–80."

***elongata, Tettigonia*** Walker, 1857b : 167. Lectotype ♂ with labels : " Type " and " elongata Walk " and " SAR." and " Wallace " and " 68.4 ".

***elvina, Tettigonia*** Butler, 1874e : 673. Lectotype ♂ with labels : " Type " and " T. elvira ; Butl." and " Amazon ; St. Paul ". This specimen is teneral and is the only specimen in the collection.

***eresia, Mareba*** Distant, 1908b : 77. Lectotype ♂ with labels : " Type " and " Mareba ; eresia ; type Dist." and " Cachabé ; low c. XI. 96. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.". This is the only specimen in the collection.

***erichsoni, Tettigoniella*** Distant, 1908f : 137. Lectotype ♂ with labels : " Type " and " Tettigoniella ; ericsoni ; Dist." and " Sumatra. ; Ericson. ; 98–222.". The bluish and bluish gray of the head and thorax is a pruinosity. The "anal segment " of the original description is actually the pygofer. The collector 's name is mis-spelt on the locality and determination labels.

***erumpens, Tettigonia*** Fowler, 1899e : 256. Lectotype ♂ with labels : " Cerro Zunil ; 4–5000 ft. ; Champion." and the B.C.A. label. The original description omitted the pustules which occur on the fore wings, and the colours are not true in the original illustration.

***espriella, Tettigoniella*** Distant, 1908a : 524. Holotype specimen without abdomen, with labels : " Type " and " Tettigoniella ; espriella ; type ; Dist." and " Peru. ; Rosenberg. ; 1906–263.". It agrees with the original description except that the transverse marking of the crown is yellow and the clavus is burnt orange. There is an additional specimen also without abdomen.

***estella, Diedrocephala*** Distant, 1908b : 59. Lectotype ♀ with labels : " Type " and " Diedrocephala ; estella ; type Dist." and " Cachabé ; low c., XII, 96. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.".

***excelsa, Apulia*** Distant, 1908a : 525. Lectotype ♀ with labels : " Type " and " Apulia ; excelsa ; type Dist.". There are two additional ♀ in the collection.

***excludens, Proconia*** Walker, 1858a : 98. Lectotype ♀ with labels : " Type " and " excludens Walk " and " Venez " and " 68.4 ". The specimen is moulded. The original description is poor.

***extricans, Tettigonia*** Walker, 1858b : 216. Lectotype ♂ with labels : " Type " and " Tettigonia extricans." and " 52 ; 96 ; Brazil ; Santarem ". It is the only specimen in the collection.

***ezba, Amblydisca*** Distant, 1908b : 69. Lectotype ♀ with labels : " Type " and " Amblydisca ; ezba Dist. ; type " and " Cachabé, ; low c., I. 97. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.". This is the only specimen in the collection. The paler markings of the original description are obsolescent.

***fausta, Tettigonia*** Walker, 1858b : 198. Holotype ♀ with labels : " Type " and " Tettigonia fausta." and " St. Dom. ; 551.".

***feralis, Tettigonia*** Fowler, 1899e : 254. Lectotype ♀ with labels : " Type " and " Tettigonia ; feralis. Fowler. ; ♀ TYPE." and " V. de Chiriqui, ; 2–3000 ft. ; Champion." and the B.C.A. label. The ♂ mentioned in the original description is probably correctly associated.

***fervens, Dilobopterus*** Walker, 1851b : 809. Holotype ♀ with labels : " Type " and " 8. Dilobopterus fervens " and " Para ".

***figurata, Aulacizes*** Fowler, 1898a : 216. Lectotype ♀ with labels : " Type " and " Aulacizes ; figurata Fowler ; TYPE." and " Cuernavaca, ; Morelos. ; June. H. H. S." and the B.C.A. label.

***flaccida, Tettigonia*** Fowler, 1900c : 278. Lectotype ♀ with labels : " Type " and " T. flaccida ; Fowler. TYPE." and " Mexico. ; Sallé Coll." and the B.C.A. label.

***flammeicolor, Pherodes*** Fowler, 1899b : 226. Holotype ♀ with labels : " Type " and " Pherodes ; flammeicolor. ; Fowler TYPE." and " Teapa. ; Tabasco. ; H. H. S." and the B.C.A. label. The specimen is very teneral.

***flavidipes, Ujna*** Distant, 1917a : 313. Lectotype ♂ with labels : " Type ; H. T." and " Ujna ; flavidipes ; type Dist." and " Mahé '08–9 ; Seychelles Exp." and " Seychelle Islands, ; Percy Sladen Trust ; Expedition. ; 1913–170.".

***flavivitta, Tettigonia*** Fowler, 1900b : 271. Lectotype ♂ with labels : " Type " and " Tettigonia ; flavivitta. ; Fowler, TYPE." and " Chilpancingo, ; Guerrero, 4600 ft. ; June. H. H. Smith." and the B.C.A. label. Of the two ♂ glued to the same card the lectotype is adjacent to a red mark I placed on the card.

***flora, Apulia*** Distant, 1908a : 526. Lectotype ♂ with labels : " Type " and " Apulia ; flora ; type Dist." and " Paramba, ; 3500′. IV. 97. ; Dry season. ; (Rosenberg)." There is an additional short series of specimens. The right fore wing is missing from the lectotype.

***fluctuosa, Amblydisca*** Fowler, 1898a : 211. Lectotype ♀ with labels : " Type " and " Amblydisca ; fluctuosa. Fowler ; TYPE " and " Caldera, ; 1200 ft. ; Champion." and the B.C.A. label. The lectotype is one of two ♀ glued to the same card and is adjacent to a red mark I placed on the card. The original English description is poor, the Latin better. The specimen agrees fairly well with the original illustration.

***fowleri, Oncometopia*** Distant, 1908b : 67. Lectotype ♀ with labels : " Type " and " Oncometopia ; fowleri ; type Dist." and " Oncometopia ; speculifera. Wlk." and " Teapa, ; Tabasco. ; March. H. H. S." and the B.C.A. label.

***fractilinea, Tettigonia*** Fowler, 1899e : 255. Lectotype ♀ with labels : " Type " and " Tettigonia ; fractilinea Fowler. ; TYPE." and " Bugaba, ; Panama. ; Champion." and the B.C.A. label.

***fusca, Tettigonia*** Walker, 1851b : 741. Holotype ♀ with labels : " Type " and " 35. Tettigonia fusca." and " 47 ; 25 ". The abdomen had been glued to the thorax (and inverted). There are two additional ♀ from Paraguay (published type locality : " Columbia ") which are not conspecific with the holotype.

***fuscipennis, Oncometopia*** Fowler, 1899b : 230. Lectotype ♂ with labels : " Chilpancingo, ; Guerrero. ; 4600 ft. ; June. H. H. Smith." and " O. fuscipennis ; Fowler." and the B.C.A. label. There was an additional specimen, without head, labeled " Type ".

***fuscolineella, Tettigonia*** Fowler, 1900d : 290. Lectotype the ♂ of a pair of specimens glued to the same card. Labels : " Type " and " Atoyac, ; Vera Cruz. ; Schumann." and " Tettigonia ; fuscolineella ; Fowler. TYPE." and the B.C.A. label.

***fusiformis, Tettigonia*** Walker, 1851b : 752. Holotype ♀ with labels : " Type " and " Tettigonia fusiformis.". The specimen is moulded and one wing is missing.

***ganesa, Kolla*** Distant, 1918b : 8. Lectotype ♀ with labels : " Type " and " Kolla ; ganesa ; type Dist." and " Kodai Kanal. ; S. India ; T. V. Campbell," and " 684 " and " S. India. ; E. A. Butler. ; 1915–60.". The lectotype is one of two ♀ glued to the same card and is adjacent to a red mark I placed on the card.

***garialis, Namsangia*** Distant, 1908g : 259. Lectotype ♂ with labels: " Type " and " Namsangia ; garialis ; type Dist " and " Margharita ; (Doherty) " and " Distant Coll. ; 1911–383 ". The legend under the original illustration of this species belongs to *Vangama steneosaura* and *vice versa*. There are several additional specimens in the collection.

**gaudens, Tettigonia** Walker, 1851b : 743. Holotype ♀ with labels : " Type " and " 40. Tettigonia gaudens." and " Ega ".

**gelida, Tettigonia** Walker, 1851b : 751. Holotype ♀ with labels : " Type " and " 55. Tettigonia gelida." and " Java ". The bluish white bloom of the original description is sparse. Walker over-emphasized the flattening of the face.

**gemina, Tettigoniella** Distant, 1918b : 2. Holotype ♀ with labels : " Type ; H. T." and " Tettigoniella ; gemina ; type Dist." and " 569 " and " S. India. ; E. A. Butler. ; 1915–60.". The original description is poor. There are no paired discal spots on the crown and there is no median carina on the pronotum. The holotype is the only specimen in the collection.

**germana, Tettigonia** Fowler, 1899d : 242. Lectotype ♀ with labels : " Type " and " Tettigonia ; germana. Fowler. ; TYPE." and " Xucumanatlan ; Guerrero, ; 7000 ft. ; July. H. H. Smith." and the B.C.A. label. The original illustration is not very good.

**gigas, Amblydisca** Fowler, 1898a : 212. Lectotype ♀ with labels : " Type " and " Amblydisca ; gigas. Fowler ; TYPE " and " Costa Rica. ; Salle." and the B.C.A. label. There is an additional ♀ in the collection.

**grandis, Tettigonia** Walker, 1851b : 745. Lectotype ♂ with labels : " Type " and " 43. Tettigonia grandis." and " Constancia ; Jany, 1857. H. Clark.".

**granulata, Tettigonia** Walker, 1858b : 195. Lectotype ♂ with labels : " Type " and " Tettigonia granulata." and " Mex ".

**gregalis, Kolla** Distant, 1908g : 226. Lectotype ♀ with labels : " Type ; H. T." and " Kolla ; gregalis ; type Dist." and " Assam " and " Distant Coll. ; 1911–383.". There were two additional ♀ in the collection.

**guerreroensis, Tettigonia** Fowler, 1899d : 246. Lectotype ♀ with labels : " Type " and " Tettigonia ; guerreroensis ; Fowler. TYPE." and " Xucumanatlan ; Guerrero, ; 7000 ft. ; July. H. H. Smith." and the B.C.A. label. The abdomen is glued separately to the card which bears the lectotype.

**guttivitta, Tettigonia** Walker, 1870b : 301. Lectotype ♀ with labels : " Type " and " guttivitta " and " Celeb ; Wallace " and " 68.4." It agrees with the original description except that there are only three ramified lines on the crown.

**habilis, Tettigoniella** Distant, 1908g : 218. Lectotype ♂ with labels : " habilis, type Dist." and " Type ; H. T." and " Nilgiri ; (Hampson) ". It is the only specimen in the collection.

**hamleti, Oncometopia** Distant, 1908b : 63. Lectotype ♀ with labels : " Type " and " Oncometopia ; hamleti ; type Dist." and " Constancia ; Jany. 1857. ; H. Clark.".

**hastata, Ciccus** Walker, 1858b : 245. Holotype ♂ with labels : " Type " and " Ciccus hastatus." and " Santarem ; Brazil ". The " foliaceous appendages " of the abdomen of the original description are merely the pygofer. This is the only specimen in the collection.

**helena, Tettigoniella** Distant, 1908g : 210. Lectotype ♀ with labels : " Type ; H. T." and " helena ; type Dist." : and " Kandy, ; Ceylon, 7–02 " and " 1162 " and " Distant Coll. ; 1911–383.". It is the only specimen in the collection.

***herbida, Tettigonia*** Walker, 1851b : 769. Lectotype ♀ with labels : " Type " and " 95. Tettigonia herbida." and " 836.". The original description is poor.

***hopinensis, Tettigoniella*** Distant, 1918b : 3. Holotype ♂ with labels : " Type ; H.T." and " Tettigoniella ; hopinensis ; type Dist." and " U. Burma ; Hopin ; 28–30.8 14 ; Fletcher Coll " and " Pusa Coll. ; 1915–164." and " Pusa Coll.".

***horsefieldi, Tettigoniella*** Distant, 1908f : 141. Lectotype ♀ with labels : " Type " and " Tettigoniella ; horsefieldi ; type Dist." and " 60–15 ; E. [ ] C." and " 71 " and " Java, ; (Horsefield.) ". There is no keel on the crown, otherwise the original description is accurate except for the wings, which agree with the original illustration.

***hyala, Apulia*** Distant, 1908a : 526. Lectotype ♀ with labels : " Type " and " Apulia ; hyala ; type Dist." and " Bolivia. ; Toungas de la Paz. ; 1903–188.".

***hydra, Tettigoniella*** Distant, 1908a : 520. Lectotype ♂ with labels : " Type " and " Tettigoniella ; hydra ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.". There are seven additional specimens in the collection.

***idonea, Tettigonia*** Fowler, 1900c : 276. Lectotype ♂ with labels : " Type " and " Tettigonia ; idonea. Fowler. ; TYPE." and " Cerro Zunil ; 4000 ft. ; Champion." and the B.C.A. label. There is a ♀ glued to the same card. The original illustration is not very accurate.

***igniceps, Tettigonia*** Walker, 1870b : 304. Lectotype ♀ with labels : " Type " and " igniceps " and " F." and " Flores ; Wallace ".

***ignifer, Ciccus*** Walker, 1861b : 804. Holotype ♂ with labels : " Type " and " 14. Ciccus ignifer." and " Colombia ".

***ignobilis, Tettigonia*** Fowler, 1899d : 248. Lectotype ♀ with labels : " Type " and " Tettigonia ; ignobilis Fowler ; TYPE." and " Omilteme, ; Guerrero, 8000 ft. ; July. H. H. Smith." and the B.C.A. label. The colours are not accurate in the original illustration. The lectotype is the specimen adjacent to the red mark I placed on the card to which two ♀ are glued.

***ignota, Tettigonia*** Walker, 1851b : 766. Holotype ♂ with labels : " Type " and " 89. Tettigonia ignota." This specimen is damaged, and the only specimen in the collection.

***illustris, Tettigoniella*** Distant, 1908g : 204. Lectotype specimen without abdomen with labels : " Type ; H. T." and " illustris ; type Dist." and " Assam " and " Distant Coll. ; 1911–383.". The original description stated that the abdomen was mutilated. There are four other specimens in the collection.

***immaculata, Tettigonia*** Walker, 1851b : 740. Holotype ♀ with labels : " Type " and " 34. Tettigonia immaculata." and " 62 ".

***inca, Tettigoniella*** Distant, 1908a : 517. Lectotype ♂ with labels : " Type " and " Amblyscarta ; inca ; type Dist." and " Cachabé ; low c. XII. 96. ; (Rosenberg)." and " Ecuador ; Rosenberg, ; 99–104.". The specimen had been repaired and was stylopized.

***inconspicua, Tettigonia*** Walker, 1870b : 303. Lectotype ♀ with labels : " Type " and " Waig." and " Wallace " and " inconspicua ". The facial keel described originally involves only the clypellus.

***indefinita, Tettigonia*** Walker, 1858b : 223. Holotype ♀ with labels : " Type " and " Tettigonia indefinita." and " Java ". It is the only specimen in the collection. It differs from the original description in that the red markings have faded to tan and that there are six yellow spots on *each* fore wing : 3 each in clavus and corium.

***indiga, Tettigoniella*** Distant, 1908g : 217. Lectotype ♀ with labels : " Type ; H. T." and " Tettigoniella ; indiga ; type Dist." and " Nilgiri ; (Hampson) " and " Distant Coll. ; 1911–383."

***induta, Tettigonia*** Fowler, 1900b : 270. Lectotype ♂ with labels : " Type " and " Tettigonia ; induta Fowler. ; TYPE " and " Orizaba ; H. S. & F. D. G. ; Dec. 1887.". It agrees with the original description except for the description of the fore wings : " with a broad black line at shoulders meeting another on the sternum ", but this appears to be an absurdity. Other specimens in the collection are coloured quite differently or are teneral.

***infecta, Tettigoniella*** Distant, 1908g : 210. Lectotype ♀ with labels : " Type ; H. T." and " Tettigoniella ; infecta ; type Dist." and " Cal " and " Distant Coll. ; 1911–383.".

***inflammata, Tettigoniella*** Distant, 1908g : 215. Lectotype ♂ with labels : " Type ; H. T." and " inflammata ; type Dist." and " Margherita ; (Doherty) " and " Distant Coll. ; 1911–383.".

***infulata, Tettigonia*** Fowler, 1900d : 282. Lectotype ♀ with labels : " Type " and " Tettigonia ; infulata. ; Fowler. ; TYPE." and " Chilpancingo, Guerrero, 4600 ft. ; June, H. H. Smith." and the B.C.A. label. The type is one of two ♀ glued to the same card and is adjacent to a red mark I placed on the card.

***innervis, Tettigonia*** Fowler, 1900c : 274. Lectotype specimen without abdomen, with labels : " Type " and " Tettigonia ; innervis ; Fowler. TYPE " and " Amula, ; Guerrero, ; 6000 ft. ; Sept. H. H. Smith." and the B.C.A. label. The other specimen eligible as lectotype was teneral.

***innotata, Tettigonia*** Walker, 1851b : 770. Holotype specimen with head, left fore wing and abdomen missing. Labels : " Type " and " 98. Tettigonia innotata." and " Brazil " and " included by Fowler ; & Van Duzee in ; *mollipes* Say.". The fragments agree with the original description.

***insignior, Aulacizes*** Fowler, 1899a : 220. Holotype specimen without abdomen, with labels : " Type " and " Aulacizes ; insignior Fowler ; TYPE " and " Panama. ; Boucard." and the B.C.A. label. The red markings are not as bright as in the original illustration. This is the only specimen in the collection.

***insignior, Tettigoniella*** Distant, 1918b : 1. Lectotype ♂ with labels : " Type ; H. T." and " Tettigoniella ; insignior ; type Dist." and " Kodai Kanal. ; S. India. ; T. V. Campbell." and " S. India. ; E. A. Butler. ; 1915–60." and " 414 ". Except that the face is not flattened and the clypellus not keeled, the specimen agrees with the original description.

***insignis, Bharata*** Distant, 1918b : 12. Lectotype ♂ with labels : " Type " and " Bharata ; insignis ; type Dist." and " Upper Burma ; (Thomas) " and " Distant Coll. ; 1911–383.". It is the only specimen in the collection.

***insignis, Kolla*** Distant, 1908g : 223. Lectotype ♀ with labels : " Type ; H. T." and " Kolla ; insignis ; type ; Dist." and " Kurseong ; 3094 ; 12 " and " Distant Coll. 1911–383 ".

***insignis, Oncometopia*** Distant, 1908b : 63. Lectotype ♀ with labels : " Type " and " Oncometopia ; insignis. ; type Dist." and " Rio Grande ; do Sul ; 94.16 ". This is the only specimen in the collection.

***insistans, Proconia*** Walker, 1858b : 232. Lectotype ♂ with labels : " Type " and " Proconia insistans." and " Rio Janeiro ; Decr. 1856. ; J. Gray.".

***insolita, Proconia*** Walker, 1858b : 227. Holotype ♀ with labels : " Type " and " Proconia insolita." and " Mex."

***instrata, Tettigonia*** Fowler, 1899c : 237. Lectotype ♂ with labels : " Type " and " Tettigonia ; instrata. Fowler. ; TYPE " and " Cerro Zunil, ; 4000 ft. ; Champion." and the B.C.A. label. The lectotype is glued beside a ♀ on the same card.

***intacta, Tettigonia*** Walker, 1851b : 746. Lectotype ♂ with labels : " 45. Tettigonia intacta." and " Colombia ". There is another specimen also eligible as type in the collection. It bore no type label.

***intensa, Tettigonia*** Walker, 1851b : 767. Holotype ♀ with labels : " Type " and " 90. Tettigonia intensa." and " Jamaica ". This is the only specimen in the collection.

***interjecta, Oncometopia*** Fowler, 1899b : 228. Lectotype ♀ with labels : " Type " and " Oncometopia ; interjecta Fowler. ; TYPE." and " Bugaba, ; Panama. ; Champion." and the B.C.A. label.

***intermedius, Ciccus*** Walker, 1851b : 803. Holotype ♂ with labels : " Type " and " 12. Ciccus intermedius." and two labels : " 44 ".

***invidenda, Aulacizes*** Fowler, 1898a : 216. Lectotype ♀ with labels : " Type " and " Aulacizes ; invidenda. Fowler ; TYPE." and " Teleman, ; Vera Paz. ; Champion." and the B.C.A. label.

***iocasta, Tettigoniella*** Distant, 1908g : 213. Holotype ♀ with labels : " Type ; H. T." and " iocasta ; type Dist." and " N. Annandale ; Calcutta ; 5–VIII–6 " and " Distant Coll.; 1911–383.". It is the only specimen in the collection.

***isabellina, Aulacizes*** Fowler, 1899a : 217. Lectotype ♂ with labels : " Type " and " Aulacizes ; isabellina. Fowler. ; TYPE." and " Cerro Zunil, ; 4000 ft. ; Champion." and the B.C.A. label and " not Aulacizes ; syn. of spectralis Fowl. ; probably JTM ". It is the only specimen in the collection.

***ithra, Kolla*** Distant, 1908a : 530. Lectotype ♂ with labels : " Type " and " Kolla ; ithra ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.". This is the only specimen in the collection.

***jemima, Tettigoniella*** Distant, 1908a : 519. Lectotype ♂ with labels : " Type " and " Tettigoniella ; jemima ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.".

***jocosa, Tettigonia*** Walker, 1857a : 97. Lectotype ♀ with labels : " Type " and " *jocosa* Walk " and " Wallace " and " 68.4 " and " Mt. Ophir ". The original description is poor. It is the only specimen in the collection.

***kharavela, Tettigoniella*** Distant, 1918b : 4. Lectotype ♀ with labels : " Type " and " Tettigoniella ; kharavela ; type Dist." and " Kodai Kanal ; S. India. Campbell." and " 424 " and " S. India ; E. A. Butler ; 1915–60.". It is the only specimen in the collection.

***klossi, Bhooria*** Distant, 1914d : 360. Lectotype ♂ with labels : " Type ; H. T." and " Bhooria klossi ; type Dist." and " Dutch ; New Guinea ; C. Boden Kloss. ; 1914–173." and " Launch Camp ; Setakwa ; Utakwa Exped. ; Oct. 1912.". There is an additional specimen in the collection.

***kodaikana, Kolla*** Distant, 1918b : 9. Lectotype ♀ with labels : " Type " and " Kolla ; kodaikana ; type Dist." and " Kodai Kanal. ; S. India, ; T. V. Campbell." and " S. India. ; E. A. Butler. ; 1915–60." and " 609 ". There are three additional topotypes in the collection.

***kotagiriensis, Tettigoniella*** Distant, 1908g : 205. Lectotype ♀ with labels : " Type " and " Tettigoniella ; kotagiriensis ; type Dist." and " Kotagiri " and " Atkinson. ; Coll.". There is a series of specimens in the collection, including a ♂, but the latter has different markings from the ♀, which agrees with the original description.

***lacerta, Phera*** Fowler, 1899b : 225. Lectotype ♀ with labels : " Type " and " Phera lacerta ; Fowler. TYPE." and " Chilpancingo. ; Guerrero, ; 4,600 ft. ; Oct. H. H. Smith." and the B.C.A. label. The pronotum is not as long as in the original illustration.

***laeta, Tettigonia*** Walker, 1851b : 748. Holotype ♀ with labels : " Type " and " Ega ; Brazil " and " 49. Tettigonia laeta.". There is an associated ♂ in the collection.

***larvata, Tettigonia*** Fowler, 1899c : 238. Lectotype ♀ with labels : " Type " and " Tettigonia ; larvata. Fowler. ; TYPE." and " Bugaba, ; 800–1,500 ft. ; Champion." and the B.C.A. label. The markings are darker than in the original illustration. There is an additional ♀ in the collection.

***latifascia, Aulacizes*** Walker, 1851b : 796. Holotype ♀ with labels : " Type " and " 13. Aulacizes latifascia." and " Vene ; zuela ". There is an associated ♂ in the collection.

***latipennis, Scaris*** Walker, 1851b : 833. Holotype ♀ with labels : " Type " and " 3. Scaris latipennis." and " Colum- ; bia ". Except that the head is not punctate, the specimen agrees with the original description. This is the only specimen in the collection.

***lativittata, Tettigonia*** Fowler, 1900d : 281. Lectotype ♂ with labels : " Type " and " Tettigonia ; lativittata ; Fowler, Type " and " Bugaba, ; Panama. ; Champion.". There are two ♀ on the same pin as the lectotype.

***latomarginata, Tettigoniella*** Distant, 1917c : 190. Lectotype ♂ with labels : " Type " and " Tettigoniella ; latomarginata ; type Dist." and " Queensland ; Upper North Pine ; 1900." and " 44D " and " Distant Coll. ; 1911–383.". There are additional specimens in the collection.

***lemniscata, Tettigonia*** Fowler, 1900d : 283. Lectotype ♀ with labels : " Type " and " Tettigonia ; lemniscata ; Fowler. TYPE " and " Xucumanatlan, ; Guerrero. ; July. H. H. Smith." and the B.C.A. label.

***lenea, Tettigoniella*** Distant, 1908a : 520. Lectotype ♂ with labels : " Type " and " Tettigoniella ; lenea ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.".

***leopardina, Tettigoniella*** Distant, 1908g : 204. Holotype ♀ with labels : " Type ; H. T." and " leopardina ; type Dist." and " Tenass Vall ; Myitta ; (Doherty)." and " Distant Coll. ; 1911–383.".

***lepidipennis, Tettigonia*** Walker, 1857b : 168. Lectotype ♂ with labels : " Type " and " lepidipennis Walk " and " Wallace " and " Sar." and " 68.4 ". The original description is inadequate. The specimen is moulded.

***leucomelas, Iassus*** Walker, 1858b : 272. Holotype ♀ with labels : " Type " and " Iassus leucomelas.". The original description is poor.

***leucomelas, Tettigonia*** Walker, 1851b : 764. Holotype ♀ with labels : " Type " and " 83. Tettigonia leucomelas." and " Brazil ". The original description is poor.

***linearis, Aulacizes*** Walker, 1851b : 791. Holotype ♂ with labels : " Type " and " 4. Aulacizes linearis." and " B. Guiana ". This is the only specimen in the collection. Except that the body is robust, not linear, and that the " white down " on the abdomen is mould, the specimen agrees with the original description.

***lineatus, Kolla*** Distant, 1908g : 224. Lectotype ♀ with labels : " Type ; H. T." and " lineatus ; type Dist." and " N. C. Prov. ; November " and " 1911–383.".

***lineolata, Tettigonia*** Walker, 1857b : 167. Lectotype ♀ with labels : " Type " and " lineolata Walk " and " Wallace " and " Sar."

***lineosa, Tettigonia*** Fowler, 1899c : 240. Lectotype ♀ with labels : " Type " and " Tettigonia ; lineosa Fowler ; TYPE " and " Bugaba, ; 800–1,500 ft. ; Champion." and the B.C.A. label. There is an associated ♂ in the collection.

***longa, Tettigonia*** Walker, 1851b : 740. Holotype specimen with labels : " Type " and " 33. Tettigonia longa." and " Phil ; Isl.". The forewings have no dark markings. The specimen is badly damaged and without legs.

***longipes, Tettigonia*** Walker, 1851b : 748. Holotype ♀ with labels : " Type " and " 50. Tettigonia longipes." and " Quito ".

***luculenta, Tettigonia*** Fowler, 1900d : 284. Lectotype ♀ with labels : " Type " and " Tettigonia ; luculenta, Fowler. ; Type." and " Omilteme. ; Guerrero, 8000 ft. ; July. H. H. Smith." and the B.C.A. label. There is a pair of associated specimens, the ♂ doubtfully conspecific.

***lugubris, Amblydisca*** Fowler, 1898a : 211. Lectotype ♀ with labels : " Type " and " Amblydisca ; lugubris. Fowler. ; TYPE." and " V. de Chiriqui, ; 4000–6000 ft. ; Champion." and the B.C.A. label. The hind legs are missing.

***luridescens, Aulacizes*** Walker, 1858b : 240. Holotype ♀ with labels : " Type " and " Aulacizes luridescens." and " Veneza. ; 55.89 ". The legs are missing and the wing apices have been broken off. This is the only specimen in the collection.

***lynchi, Faenius*** Distant, 1918b : 14. Lectotype ♀ with labels : " Co- ; type " and " Faenius ; lynchi ; type Dist." and " Ind. Mus. ; Darjiling ; District ;

E. Himalayas ; Lynch C." and " 2504 ; 21 " and " Distant Coll. ; 1911–383.". There is an additional ♀ in the collection.

***mactata, Tettigonia*** Walker, 1858b : 216. Holotype specimen without abdomen, with labels : " Type " and " Tettigonia mactata." and " Veneza. ; 55.89.". The original description is poor. This is the only specimen in the collection.

***maculata, Atkinsoniella*** Distant, 1908g : 236. Lectotype ♀ with labels : " Type ; H. T." and " Atkinsoniella ; maculata ; type Dist." and " Assam ; Shillong ". There is an additional ♂ in the collection.

***maculata, Aulacizes*** Walker, 1851b : 793. Holotype ♀ with labels : " Type " and " 7. Aulacizes maculata." and " 43.".

***maculatus, Ciccus*** Walker, 1851b : 801. Lectotype ♀ with labels : " Type " and " 8. Ciccus maculatus."

***maculicollis, Tettigonia*** Walker, 1870b : 302. Lectotype ♂ with labels : " Type " and " maculicollis " and " N. Gui ; Wallace " and " S " and " 68.4 ".

***magna, Proconia*** Walker, 1851b : 787. Holotype ♀ with labels : " Type " and " 15. Proconia magna." and " Bz " and " 42 ; 6.". One fore wing is missing. There is an additional ♂ in the collection.

***magnifrons, Aulacizes*** Walker, 1858b : 238. Holotype ♀ with labels : " Type " and " Aulacizes magnifrons." and " Petropolis ; Feby. 1857. ; J. Gray.". It agrees with the original description except that there are three spots on the anterior portion of the pronotum instead of two. The specimen is teneral.

***marcia, Stictoscarta*** Distant, 1908b : 68. Lectotype ♀ with labels : " Type " and " Stictoscarta ; marcia ; type Dist." and " Amaz ; Nanta " and " 58.77. Amazon. ; Nanta.".

***marginata, Proconia*** Walker, 1851b : 785. Holotype ♂ with labels : " Type " and " 11. Proconia marginata." and " E. Doubleday. ; St. John's Bluff, ; E. Florida.".

***marpessa, Tettigoniella,*** 1908g : 215. Lectotype ♀ with labels : " Type ; H. T." and " marpessa ; type Dist." and " Myitta ; Doherty " and " Distant Coll. ; 1911–383.". The dark line across the base of the face, of the original description, is merely one of the antennae stuck to the face. This is the only specimen in the collection.

***mazaria, Zyzzogeton*** Distant, 1908b : 84. Lectotype ♀ with labels : " Type " and " Zyzzogeton ; mazaria ; type Dist." and " R. Dagua. ; Colombia ; 96–68.".

***mediolineata, Tettigonia*** Fowler, 1899d : 244. Lectotype ♂ with labels : " Type " and " Tettigonia ; mediolineata ; Fowler, TYPE." and " Omilteme, ; Guerrero, ; 8000 ft. ; Aug. H. H. Smith." and the B.C.A. label.

***medusa, Tettigonia*** Distant, 1893a : 95. Lectotype ♀ with labels : " Type ; H. T." and " medusa ; Dist." and " Machachi, ; Ecuador. ; 9–10,000 feet. ; Ed. Whymper." and " Distant Coll. ; 1911–383.". It is teneral, and the only specimen in the collection.

***melancholica, Tettigonia*** Fowler, 1899c : 240. Lectotype ♀ with labels : " Type " and " Tettigonia ; melancholica ; Fowler, TYPE." and " Bugaba, ; 800–1,500 ft. ; Champion." and the B.C.A. label. It agrees with the original description except that, in the description of the scutellum, after the word " testaceous ", the word " tegmina " appears to have been deleted.

***mimica, Kolla*** Distant, 1908g : 225. Lectotype ♂ with labels : " Type ; H. T." and " mimica ; type Dist." and " at light ; Calcutta ; 4–XI–06.N. A." and " Distant Coll. ; 1911–383.".

***miniaticeps, Tettigonia*** Fowler, 1900d : 285. Lectotype ♂ with labels : " Type " and " Tettigonia ; miniaticeps ; Fowler, TYPE." and " Teapa ; Tabasco. ; April. H. H. Smith." and the B.C.A. label. The lectotype is one of a pair glued to the same card.

***miniatipennis, Oncometopia,*** 1899b : 231. Lectotype ♀ with labels : " Type " and " Oncometopia ; miniatipennis. ; Fowler. TYPE." and " Milpas, Mex., ; 5900 ft. ; Forrer." and the B.C.A. label. This is the only specimen in the collection. The shape and colour of the head are not accurate in the original illustration.

***minor, Tettigonia*** Walker, 1851b : 772. Holotype ♂ with labels : " Type " and " 101. Tettigonia minor.". It agrees with the interpretation of Young and Davidson, 1959a : 24.

***mitra, Diedrocephala*** Distant, 1908b : 60. Lectotype ♂ with labels : " Type " and " Diedrocephala ; mitra ; type Dist." and " Cachabé ; low c., XII. 96. ; (Rosenberg) " and " Ecuador. ; Rosenberg. ; 99–104.". There are also a ♀ and two specimens without abdomens in the collection.

***mitrata, Tettigoniella*** Distant, 1908f : 140. Lectotype ♂ with labels : " Type " and " Tettigoniella ; mitrata ; type Dist." and " Humboldt Bay" and " Malay Archipelago. ; W. Doherty. ; 1903–31.". There is an additional series in the collection.

***modulata, Bhooria*** Distant, 1908g : 256. Lectotype ♀ with labels : " Type " and " Bhooria ; modulata ; type Dist." and " Ruby Mines ; C. Doherty " and " Distant Coll. ; 1911–383.". This is the only specimen in the collection.

***mollicella, Tettigonia*** Fowler, 1900d : 289. Lectotype ♀ with labels : " Type " and " T. mollicella ; Fowler, TYPE " and " Vera Cruz. ; May. H. H. S." and the B.C.A. label.

***mollicula, Tettigonia*** Fowler, 1900d : 288. Lectotype ♀ with labels : " Type " and " Tettigonia ; mollicula Fowler ; TYPE " and " Xucumanatlan ; Guerrero, 7,000 ft. ; July. H. H. Smith." and the B.C.A. label. Of two ♀ glued to the same card, the lectotype is adjacent to a red mark I placed on the card.

***monticola, Tettigonia*** Fowler, 1899d : 244. Lectotype ♂ with labels : " Type " and " Tettigonia ; monticola ; Fowler. TYPE." and " Sierra de las ; Aguas Escondidas ; Guerrero, 9500 ft. ; July. H. H. Smith." and the B.C.A. label. It is the only specimen in the collection.

***mouhoti, Tettigoniella*** Distant, 1908f : 142. Lectotype ♂ with labels : " Type " and " Tettigoniella ; mouhoti ; type Dist." and " Siam ; Mouhot ". The original description specified a ♀, but there is no ♀ with correct data in the collection. The lectotype agrees otherwise with the original description except that the flattening of the face is negligible.

***multicolor*, *Tettigonia*** Walker, 1851b : 760. Lectotype ♀ with labels : " Type " and " Para " and " 75. Tettigonia multicolor.". This is the only specimen in the collection.

***multilineata*, *Tettigonia*** Fowler, 1899d : 241. Lectotype specimen with labels : " Type " and " Tettigonia ; multilineata ; Fowler. TYPE " and " Pinos Altos ; Chihuahua, ; Mexico. ; Buchan–Hepburn." and the B.C.A. label.

***munda*, *Oncometopia*** Fowler, 1899b : 232. Lectotype ♀ with labels : " Type " and " Oncometopia ; munda. Fowler. ; TYPE. ♀ " and " Omilteme, ; Guerrero. ; 8000 ft. ; Aug. H. H. Smith " and the B.C.A. label. This is the only specimen in the collection. The original description is not good.

***mungphuensis*, *Kolla*** Distant, 1908g : 225. Holotype ♀ with labels : " Type " and " Kolla ; mungphuensis ; type Dist." and " Mungphu ". This and several other specimens in the collection are teneral.

***nasuta*, *Tettigonia*** Fowler, 1900d : 291. Lectotype specimen without abdomen, with labels : " Type " and " Tettigonia ; nasuta. Fowler ; TYPE." and " Chiacaman, ; Vera Paz. ; Champion." and the B.C.A. label. The specimen is moulded and the apices of the fore wings are missing. It is the only specimen in the collection.

***neotropicalis*, *Teletusa*** Distant, 1908b : 79. Lectotype ♂ with labels : " Type " and " Teletusa ; neotropicalis ; type Dist." and " Peru. ; Rosenberg ; 1906–263.". Except that the fore wings are completely hyaline and that the anterior tibiae are only moderately dilated, this specimen, the only one in the collection, agrees with the original description.

***nigricans*, *Proconia*** Walker, 1851b : 783. Lectotype ♂ with labels : " Type " and " 8. Proconia nigricans." and " E. Doubleday. ; St. John's Bluff, ; E. Florida.".

***nigrifascia*, *Tettigonia*** Walker, 1851b : 776. Holotype ♂ with labels : " Type " and " 110. Tettigonia nigrifascia." and " Mexico ". It agrees with the original description but is teneral, which accounts for the concavities in the face and on the crown.

***nigrifrons*, *Tettigoniella*** Distant, 1917c : 190. Lectotype ♀ with labels : " Type " and " Tettigoniella ; nigrifrons ; type Dist." and " Buar vii. 1914 ; Cameroons." and " 1917–89.".

***nigrilux*, *Ciccus*** Walker, 1858b : 246. Holotype ♀ with labels : " Type " and " Ciccus nigrilux." and " Mex ".

***notanda*, *Tettigonia*** Fowler, 1900a : 257. Lectotype ♀ with labels : " Type " and " Tettigonia ; notanda ; Fowler. TYPE " and " Panama " and " Boward " and the B.C.A. label. It agrees well with the original description but the original illustration is poor.

***notaticeps*, *Tettigonia*** Fowler, 1900c : 273. Lectotype ♀ with labels : " Type " and " Tototonicapam, ; 85–10,500 ft. ; Champion." and " T. notaticeps. ; Fowler, TYPE." and the B.C.A. label. The original illustration is not good. This is the only specimen in the collection.

**oaxacae, Oncometopia** Fowler, 1899c : 234. Lectotype ♂ with labels : " Type " and " 58.135. Mex. ; (Oajaca.) " and " Proconia ; oajacae ; Fowler TYPE ". This is the only specimen in the collection.

**obliqua, Aulacizes** Walker, 1858b : 239. Holotype ♀ with labels : " Type " and " Aulacizes obliqua." and " Mex ".

**obliquus, Ciccus** Walker, 1851b : 800. Lectotype ♂ with labels : " Type " and " 6. Ciccus obliquus." and " 42 " and " Bz ".

**obscura, Tettigonia** Walker, 1851b : 738. Lectotype ♂ with labels : " Type " and " 28. Tettigonia obscura " and " E. Ind ".

**obscurior, Phera** Fowler, 1899a : 224. Lectotype ♂ with labels : " Type " and " Phera ; obscurior ; Fowler. TYPE." and " San Isidro, ; 1600 ft. ; Champion.".

**obtusa, Aulacizes** Walker, 1858b : 239. Holotype ♀ with labels : " Type " and " Aulacizes obtusa." and " Rio Janeiro ; Decr. 1856. ; J. Gray.". The specimen is teneral.

**obtusifrons, Phera** Fowler, 1899a : 223. Lectotype ♂ with labels : " Type " and " Phera ; obtusifrons ; Fowler. TYPE. ♂ " and " Cerro Zunil, ; 4–5000 ft. ; Champion." and the B.C.A. label. The original illustration was made from a ♀.

**obtusior, Tettigonia** Fowler, 1900c : 278. Lectotype ♀ with labels : " Type " and " Tettigonia ; obtusior. ; Fowler. TYPE." and " V. de Chiriqui, ; 25–4000 ft. ; Champion." and the B.C.A. label. There is an additional ♀ in the collection.

**ochraceus, Ciccus** Walker, 1858b : 244. Holotype ♀ with labels : " Type " and " Mex." and " Ciccus ochraceus.".

**ofella, Amblydisca** Distant, 1908b : 71. Lectotype ♀ with labels : " Type " and " Amblydisca ; ofella ; type ♀ Dist." and " Toungas de la Paz. ; 1903–188.". There is an additional topotypic ♂.

**opponens, Tettigonia** Walker, 1851b : 757. Holotype ♂ with labels : " Type " and " 71. Tettigonia opponens." and " N. India ".

**opulenta, Tettigonia** Walker, 1851b : 747. Holotype ♀ with labels : " Type " and " 47. Tettigonia opulenta." and " Veneza. ; 55.89.". The original description is poor. There is an additional ♂ in the collection.

**orbata, Tettigonia** Fowler, 1900d : 286. Lectotype ♂ with labels : " Type " and " Tettigonia ; orbata Fowler. ; TYPE." and " Teapa, ; Tabasco. ; April. H. H. S." and the B.C.A. label.

**ostrina, Tettigonia** Fowler, 1900a : 257. Lectotype ♂ with labels : " Type " and " Tettigonia ; ostrina Fowler. ; TYPE." and " V. de Chiriqui, ; 25–4000 ft. ; Champion." and the B.C.A. label.

**pallescens, Pisacha** Distant, 1908g : 231. Lectotype ♂ with labels : " Type ; H. T." and " Pisacha ; pallescens. ; type Dist." and " Myitta ; Doherty " and " Distant Coll. ; 1911–383.".

**pallida, Tettigonia** Walker, 1851b : 776. Holotype ♀ with labels : " Type " and " 111. Tettigonia pallida." and " Mexico ".

**pallipes, Tettigonia** Walker, 1851b : 765. Lectotype ♀ with labels : " Type " and " 86. Tettigonia pallipes." and " Brasil ".

***panamensis, Aulacizes*** Fowler, 1899a : 219. Lectotype ♂ with labels : " Type " and " Aulacizes ; panamensis ; Fowler. TYPE." and " Bugaba, ; 800–1500 ft. ; Champion." and the B.C.A. label. The original illustration is poor. There is an additional ♂ in the collection.

***paraguayensis, Teletusa*** Distant, 1908b : 78. Lectotype ♀ with labels : " Type " and " Teletusa ; paraguayensis ; type Dist." and " Paraguay. ; San Bernardino. ; K. Fiebrig. ; 1905–327.". This is the only specimen in the collection.

***parallela, Proconia*** Walker, 1851b : 788. Holotype ♂ with labels : " Type " and " 18. Proconia parallela." and " Vene ; zuela ".

***pardalina, Tettigonia*** Fowler, 1899c : 238. Lectotype ♀ with labels : " Type " and " Tettigonia ; pardalina Fowler. ; TYPE " and " V. de Chiriqui, ; 25–4000 ft. ; Champion." and the B.C.A. label. Except that there is only one spot behind the transverse line on the fore wing, the specimen agrees with the original description.

***paulula, Tettigonia*** Walker, 1858b : 219. Holotype ♂ with labels : " Type " and " Tettigonia paulula." and " Ceylon ". The specimen is badly damaged.

***pectoralis, Tettigonia*** Fowler, 1900d : 285. Lectotype ♀ with labels : " Type " and " Tettigonia ; pectoralis. ; Fowler. TYPE " and an illegible pencilled label and " Chilpancingo, ; Guerrero, ; 4600 ft. ; June. H. H. Smith." and the B.C.A. label. The wings and posterior half of the pronotum are deep green, and the black face is visible from above as a narrow black anterior margin to the crown. Otherwise, the specimen agrees with the original description.

***perakensis, Tettigoniella*** Distant, 1908f : 141. Lectotype ♂ with labels : " Type " ; H. T." and " perakensis ; type Dist." and " Perak, ; Doherty." and " Distant Coll. ; 1911–383.". It is the only specimen in the collection.

***persistans, Proconia*** Walker, 1858b : 232. Lectotype ♂ with labels : " Type " and " Proconia persistans." and " Petropolis ; Feby. 1857. ; J. Gray.". The specimen is teneral.

***peruviensis, Teletusa*** Distant, 1908b : 79. Lectotype ♂ with labels : " Type " and " Teletusa ; peruviensis ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.".

***peruviensis, Oncometopia*** Distant, 1908b : 67. Lectotype ♂ with labels : " Type " and " Oncometopia ; peruviensis ; type Dist." and " Peru. ; Rosenberg ; 1906–263.". There is an additional ♂ in the collection.

***phalaesia, Aulacizes*** Distant, 1908b : 74. Lectotype ♀ with labels : " Type " and " Aulacizes ; phalaesia ; type Dist." and " Bolivia. ; J. Steinbach. ; 1904–311.". There is an additional ♂ in the collection.

***philippina, Tettigonia*** Walker, 1851b : 740. Holotype ♀ with labels : " Type " and " 32. Tettigonia Philippina." and " Phil ; Isl ". There are six additional ♀ in the collection.

***picta, Amblyscarta*** Distant, 1908a : 517. Lectotype ♀ with labels : " Type " and " Amblyscarta ; picta ; type Dist." and " Bolivia ; Toungas de la Paz ; 1903–188.".

***picta, Tettigonia*** Walker, 1851b : 758. Holotype ♀ with labels : " Type " and " 72. Tettigonia picta." and " 829 ".

***pileata, Tettigonia*** Fowler, 1900d : 287. Lectotype ♂ with labels : " V. de Chiriqui, ; 2–3000 ft. ; Champion." and the B.C.A. label. There are additional ♀ specimens in the collection.

***piperata, Aulacizes*** Fowler, 1898a : 215. Lectotype ♀ with labels : " Type " and " Aulacizes ; piperata. Fowler. ; TYPE " and " Xucumanatlan, Guerrero, ; 7000 ft. ; July. H. H. Smith." and the B.C.A. label. The original illustration is poor. There is an additional ♂ in the collection.

***plagiata, Proconia*** Walker, 1851b : 788. Holotype ♀ with labels : " Type " and " 17. Proconia plagiata." and " 621 ".

***plumbea, Tettigonia*** Walker, 1851b : 754. Lectotype ♀ with labels : " Type " and " 62. Tettigonia plumbea." and " 46 ; 62 ". There is an additional specimen, without abdomen, in the collection.

***postfumata, Amblydisca*** Fowler, 1898a : 210. Lectotype ♂ with labels : " Type " and " Amblydisca ; postfumata ; Fowler. TYPE." and " V. de Chiriqui, ; 25–4000 ft. ; Champion." and the B.C.A. label. There is an additional ♂ in the collection.

***praestantior, Tettigonia*** Fowler, 1899e : 254. Lectotype ♀ with labels : " Type " and " Tettigonia ; praestantior ; Fowler TYPE " and " Bugaba, ; 800–1500 ft. ; Champion." and the B.C.A. label. There is an additional ♂ in the collection.

***praeterita, Tettigonia*** Fowler, 1899d : 243. Lectotype ♀ with labels : " Type " and " Tettigonia ; praeterita ; Fowler TYPE." and " Xucumanatlan, ; Guerrero, ; 7000 ft. ; July. H. H. Smith." and the B.C.A. label. There is an additional ♀ in the collection.

***prasina, Tettigonia*** Walker, 1851b : 768. Lectotype ♀ with labels : " Type " and " 92. Tettigonia prasina." and " Hudson's Bay ". It agrees with Young and Davidson's (1959a : 9) interpretation of the species.

***primitiva, Pisacha*** Distant, 1908g : 231. Lectotype ♀ with labels : " Type ; H. T." and " Pisacha ; primitiva ; type Dist." and " Ruby Mines ; (Doherty) " and " Distant Coll. ; 1911–383.". It agrees with the original description, but there is nothing at all unusual about the spines of the hind tibiae. The original illustration is much more robust than the specimen.

***princeps, Baramapulana*** Distant, 1910e : 235. Holotype ♀ with labels : " Type ; H. T." and " Baramapulana ; princeps ; type ; Dist." and " Johannesburg ; 6000 ft. 1899 ; J. P. Cregoe " and " Distant Coll. ; 1911–383.".

***producta, Tettigonia*** Walker, 1851b : 772. Holotype ♂ with labels : " Type " and " 102. Tettigonia producta." and " E. Doubleday. ; St. John's Bluff ; E. Florida.". The specimen agrees with the interpretation of Young and Davidson (1959a : 19.).

***prolixa, Tettigonia*** Fowler, 1900c : 275. Lectotype ♀ with labels : " Type " and " Tettigonia ; prolixa. Fowler ; TYPE " and " Atoyac, Vera Cruz. ; May. H. H. S." and the B.C.A. label. It is the specimen adjacent to a red mark I placed on the card bearing two ♀.

***pronotalis, Kolla*** Distant, 1918b : 8. Lectotype ♀ with labels : " Type " and " Kolla ; pronotalis ; type Dist. : and " 101.6 " and " Lovedale ; Nilgiri Hills. ;

S. India. 7200 ft. ; T. V. Campbell." and " S. India. ; E. A. Butler. ; 1915–60.". Of the two ♀ on the same card, the lectotype is between two red marks I placed on the card. Distant twice described the lateral spots of the anterior margin of the head—once on the vertex and once on the face. He did not mention a yellow spot at the middle of the anterior margin of the pronotum.

***pruinosa, Tettigonia*** Walker, 1851b : 743. Holotype ♂ with labels : " Type " and " 39. Tettigonia pruinosa." and " Colum- ; bia ". Except that the head is not semicircular, and that the face is scarcely flattened, the lectotype agrees with the original description. The specimen is somewhat teneral, heavily parasitized, and without hind legs. It is the only specimen in the collection.

***pruinosa, Tettigonia*** Walker, 1851b : 755. Holotype specimen without abdomen, with labels : " Type " and " 64. Tettigonia pruinosa " and " 40 ; 56 ".

***psittacella, Tettigonia*** Fowler, 1900d : 290. Lectotype ♂ with labels : " Type " and " Tettigonia ; psitacella ; Fowler. TYPE." and " Teapa. ; Tabasco. ; H. H. S." and the B.C.A. label. It is one of a pair of specimens glued to the same card.

***ptolyca, Diestostemma*** Distant, 1908b : 82. Lectotype ♂ with labels : " Type " and " Diestostemma ; ptolyca ; type Dist." and " Theresopolis ; 88–137." and one additional illegible label consisting only of numbers. The specimen is somewhat teneral. There is one additional ♂ in the collection.

***pumicata, Tettigonia*** Fowler, 1899d : 246. Lectotype ♀ with labels : " Type " and " Tettigonia ; pumicata ; Fowler. TYPE " and " V. de Chiriqui ; 4,000–6,000 ft. ; Champion " and the B.C.A. label. It agrees with the original description and illustration. It is laterally compressed posteriorly, however, as a result of having been wet. The lectotype is the one of two ♀ specimens which is adjacent to a red mark I placed on the card to which they are glued.

***punctosus, Ciccus*** Walker, 1858b : 246. Holotype ♀ with labels : " Type " and " Ciccus punctosus." and " Tejuca ; Jany. 1857. ; H. Clark.". There is an additional ♀ in the collection.

***pupula, Tettigonia*** Kirby, 1891a : 169. Lectotype ♀ with labels : " Type " and " Tettigonia ; pupula ; Kb type ; [one illegible word] " and " Pundaloya ; Ceylon " and " 100 ". It is the only specimen in the collection.

***purpurascens, Tettigonia*** Fowler, 1900a : 259. Lectotype ♀ with labels : " Type " and " V. de Atitlan ; 25–3500 ft. ; Champion." and " Tettigonia ; purpurascens ; Fowler. TYPE." and the B.C.A. label. It is much less distinctly marked than in the original description. It is the only specimen in the collection.

***pythonis, Tettigoniella*** Distant, 1908g : 207. Lectotype ♀ with labels : " Type ; H. T." and " Tettigoniella ; pythonis ; type Dist." and " Tenass Vall ; Myitta (Doherty)." and " Distant Coll. ; 1911–383.". This is the only specimen in the collection.

***quadrimacula, Tettigonia*** Walker, 1851b : 741. Holotype ♀ with labels : " Type " and " 36. Tettigonia quadrimacula." and " Colum ; bia ".

***quadrinotata, Oncometopia*** Fowler, 1899b : 230. Lectotype ♀ with labels : " Type " and " Oncometopia ; quadrinotata. ; Fowler. TYPE " and " Jalisco, Mex. ; July. ; Schumann." and the B.C.A. label. The original illustration is not very good. Of the two ♂ specimens associated with the ♀ by Fowler, one that is badly damaged appears to be conspecific with the ♀ ; the other not.

***quinquesignata, Tettigonia*** Walker, 1858b : 194. Lectotype specimen without abdomen, with labels : " Type " and " Tettigonia ; 5-signata." and " Mex ". It differs from the original description in that the scutellum is black basally and at the apex, only the disc being yellow. There is an additional ♂ specimen.

***raja, Kolla*** Distant, 1918b : 7. Lectotype ♂ with labels : " Co- ; type " and " Kolla ; raja ; cotype Dist." and " Siliguri ; N. Bengal. ; 18–20. VII.07 ". The original description is poor.

***ramana, Tettigoniella*** Distant, 1908f : 138. Lectotype ♀ with labels : " Type " and " Tettigoniella ; ramana ; type Dist." and " Sumatra, Erichson. ; 98–222.". The blue colour of the original description is a pruinosity. There is an additional ♂ in the collection.

***recta, Tettigonia*** Fowler, 1900a : 264. Lectotype ♂ with labels : " Type " and " Tettigonia ; recta Fowler. ; TYPE " and " Venta de Zopilote, ; Guerrero, 2800 ft. ; Oct. H. H. Smith." and the B.C.A. label.

***redacta, Tettigonia*** Fowler, 1900c : 276. Lectotype ♀ with labels : " Type " and " Peña Blanca, ; 3000–4000 ft. ; Champion." and " T. redacta ; Fowler TYPE.".

***reducta, Tettigonia*** Walker, 1851b : 739. Lectotype ♂ with labels : " Type " and " 30. Tettigonia reducta." and " Hong ; Kong ".

***redundans, Tettigonia*** Fowler, 1899e : 251. Lectotype ♀ with labels : " Type " and " Tettigonia ; redundans ; Fowler, TYPE " and " Cahabon ; Vera Paz. ; Champion." and the B.C.A. label. The original illustration is not very good. There are several additional specimens in the collection.

***reservata, Tettigonia*** Fowler, 1900b : 267. Lectotype ♀ with labels : " Type " and " Tettigonia ; reservata. ; Fowler ; TYPE." and " Atoyac, ; Vera Cruz. ; April. H. H. S." and the B.C.A. label. The specimen is the one of two ♀, glued to the same card, which is adjacent to the red mark I placed on the card. The other ♀ has a missing wing.

***resimus, Catorthorrhinus*** Fowler, 1898a : 213. Lectotype ♂ with labels : " Type " and " Catorthorhinus ; resimus, Fowler ; TYPE." and " V. de Chiriqui, ; 25–4000 ft. ; Champion." and the B.C.A. label. The markings along the claval suture are brown instead of green as in the original illustration.

***resolubilis, Tettigonia*** Fowler, 1899c : 236. Lectotype ♂ with labels : " Type " and " Tettigonia ; resolubilis. ; Fowler. TYPE." and " Capetillo, ; Guatemala, ; G. C. Champion." and the B.C.A. label.

***reversa, Tettigonia*** Walker, 1858b : 215. Holotype ♀ with labels : " Type " and " Tettigonia reversa." and " Petropolis ; Feby 1857. ; H. Clark.". This is the only specimen in the collection.

***richmondensis, Tettigoniella*** Distant, 1917c : 191. Lectotype ♀ with labels : " Type " and " Tettigoniella ; richmondensis ; type Dist." and " 51 " and " 1911–190.". This is the only specimen in the collection.

***robusta*, *Tettigonia*** Walker, 1851b : 777. Holotype ♀ with labels : " Type " and " 113. Tettigonia robusta." and " 18.". Except that the head is broader than the thorax, that the face is not flat and the " epistoma " not keeled, the specimen agrees with the original description.

***robustula*, *Tettigonia*** Fowler, 1900d : 288. Lectotype ♀ with labels : " Type " and " T. robustula ; Fowler. TYPE." and " Sierra de las ; Aguas Escondidas, ; Guerrero, 9500 ft. ; July. H. H. Smith." and the B.C.A. label. The original description and illustration are not good.

***rosenbergi*, *Tettigoniella*** Distant, 1908a : 518. Lectotype ♀ with labels : " Type " and " Amblyscarta ; rosenbergi ; type ; Dist." and " Cachabé ; low c., XI. 96. ; (Rosenberg)." and " Ecuador, ; Rosenberg. ; 99–104.". There are two additional ♀ in the collection.

***rubescens*, *Oncometopia*** Fowler, 1899c : 233. Lectotype ♂ with labels : " Type " and " Oncometopia ; rubescens. Fowler. ; TYPE " and " David, ; Chiriqui. ; Champion." and the B.C.A. label. It agrees with the original illustration except that the anterolateral margins of the crown are convex and that the apex is not angulate.

***rubricollis*, *Tettigonia*** Fowler, 1900a : 260. Lectotype ♂ with labels : " Type " and " Tettigonia ; rubricollis. ; Fowler. TYPE " and " Omilteme ; Guerrero ; 8000 ft. ; Aug. H. H. Smith " and the B.C.A. label. There are two additional specimens in the collection.

***rubriguttata*, *Tettigonia*** Walker, 1851b : 763. Lectotype ♀ with labels : " Type " and " 82. Tettigonia rubriguttata " and " W Coast ; of Am ". There is an additional ♀ in the collection.

***rufa*, *Tettigonia*** Walker, 1851b : 742. Lectotype ♂ with labels : " Type " and " 37. Tettigonia rufa." and " Vene- ; zuela ".

***ruficaput*, *Tettigonia*** Walker, 1851b : 766. Holotype ♀ with labels : " Type " and " 87. Tettigonia ruficaput." and " Colum- ; bia ". It agrees with the original description except that the face is not flattened.

***ruficauda*, *Tettigonia*** Walker, 1851b : 763. Lectotype ♀ with labels : " Type " and " 81. Tettigonia ruficauda." and " Brazil ". The head is not concave on the anterior margin. Otherwise the specimen agrees with the original description.

***ruficeps*, *Tettigonia*** Walker, 1858b : 196. Lectotype ♀ with labels : " Type " and " Tettigonia ruficeps." and " Guatim ; ala ". It agrees with the original description except that the anterior band of the thorax is red, not white. There is an additional ♂ in the collection.

***ruficeps*** var. ***deficiens*, *Tettigonia*** Fowler, 1899c : 236. Lectotype ♀ with labels : " Type " and " T. ruficeps ; v. deficiens. ; Fowler. TYPE." and " Cache. ; Costa Rica. ; H. Rogers." and the B.C.A. label. There is a topotypic ♂ in the collection.

***ruficeps*** var. ***trilineata*, *Tettigonia*** Fowler, 1899c: 236. Lectotype ♀ with labels : " Type " and " Tett. ruficeps ; var trilineosa ; Fowler. TYPE." and " David, ; Chiriqui. ; Champion." and the B.C.A. label. There are twelve additional ♀ in the collection.

***ruficosta, Tettigonia*** Walker, 1870b : 302. Lectotype ♀ with labels : " Type " and " ruficosta " and " Wallace " and " 68.4 " and " Bac.". Except that the head is wider than the pronotum, the specimen agrees with the original description. There is an additional specimen in the collection.

***rufifacies, Ciccus*** Walker, 1851b : 802. Holotype ♂ with labels : " Type " and " 11. Ciccus rufifacies." and " Bz " and " 40 ; 16 ".

***rufimargo, Tettigonia*** Walker, 1858b : 197. Holotype ♀ with labels : " Type " and " Tettigonia rufimargo." and " Mex.". There is an additional ♀ in the collection.

***rufimargo*** var. ***propior, Tettigonia*** Fowler, 1900d : 284. Lectotype ♀ with labels : " Type " and " Bugaba, ; Panama. ; Champion." and " T. rufimargo Walk ; v. propior. Fowler. ; TYPE." and the B.C.A. label. There are several additional specimens in the collection.

***rufiventris, Aulacizes*** Walker, 1851b : 796. Lectotype ♀ with labels : " Type " and " 12. Aulacizes rufiventris." and " E. Doubleday. ; St. John's Bluff, ; E. Florida.".

***rufoapicata, Tettigonia*** Fowler, 1900d : 286. Lectotype ♂ with labels : " Type " and " Tettigonia ; rufapicata ; Fowler. TYPE " and " Bugaba, ; 800–1,500 ft. ; Champion." and the B.C.A. label. The dark markings are much more pronounced than in the original illustration.

***rufofasciata, Tettigonia*** Distant, 1879b : 63. Lectotype ♀ with labels : " rufofasciata ; type Dist." and " Cache, ; Costa Rica. ; H. Rogers." and " Distant Coll. ; 1911–383.". There is an additional ♂ in the collection.

***sagittarius, Ciccus*** Walker, 1858b : 245. Holotype ♂ with labels : " Type " and " Ciccus sagittarius." and " Santar ; em ". It is very teneral, and the only specimen in the collection.

***salutaris, Tettigonia*** Fowler, 1900d : 281. Lectotype ♀ with labels : " Type " and " Tettigonia ; salutaris Fowler. ; TYPE." and " Bugaba, Panama. ; Champion." and the B.C.A. label. There is a mixed series associated with the lectotype.

***salvini, Amblydisca*** Fowler, 1898a : 209. Lectotype ♀ with labels : " Type " and " Amblydisca ; salvini. Fowler. ; TYPE " and " Bugaba, ; 800–1000 ft. ; Champion.". There is an additional ♂ in the collection.

***sandaracata, Tettigoniella*** Distant, 1908g : 217. Lectotype ♀ with labels : " Type ; H. T." and " Tettigoniella ; sandaracata ; type Dist." and " Nilgiri ; (Hampson) " and " Distant Coll. ; 1911–383.". There is an additional ♂ in the collection.

***sanguinans, Tettigonia*** Walker, 1858b : 212. Holotype ♂ with labels : " Type " and " Tettigonia sanguinans." and " Tejuca ; Jany 1857. ; H. Clark.".

***sanguinosa, Scaris,*** 1858a : 101. Lectotype ♂ with labels : " Type " and " sanguinosa Walk " and " Col-l- ; grass " and " Bogota ; Santo [ ]unato " and " 68.4 ".

***sarawakensis, Bhandara*** Distant, 1908f : 143. Lectotype ♀ with labels : " Sarawak. ; Shelford. ; 1900–117.". The original description specified a ♀. The collection contains a teneral ♂ with a " type " label. There is another ♂ in the collection.

***satelles, Tettigonia*** Fowler, 1900d : 288. Lectotype ♀ with labels : " Type " and " T. satelles ; Fowler. TYPE " and " Teapa, ; Tabasco. ; H. H. Smith." and the B.C.A. label. There is another topotypic ♀ without a head.

***schonlandi, Tettigoniella*** Distant, 1910e : 233. Lectotype ♀ with labels : " Type ; H. T." and " Tettigoniella ; schonlandi ; type Dist." and " Albany ; Museum ; Grahams ; Town." and " Distant Coll. ; 1911–383." and " Natal ; June 12 ; Mr. Blake ; way.". It is the only specimen in the collection. The fore wing is missing.

***scita, Tettigonia*** Walker, 1851b : 753. Holotype ♂ with labels : " Type " and " 60. Tettigonia scita " and " Vene- ; zuela ". The head had been glued on. There is an additional ♂ in the collection.

***scitipennis, Tettigonia*** Walker, 1857b : 168. Lectotype ♂ with labels : " Type " and " scitipennis Walk " and " Sar. " and " Wallace " and "68.4 ". The original description is poor. The head and pronotum are greatly distorted. This is the only specimen in the collection.

***scutellaris, Tettigonia*** Walker, 1870b : 303. Lectotype ♂ with labels : " Type " and "scutellaris " and " Wallace " and " Bac." and " 68.4 ". The specimen is somewhat teneral. The type locality is probably Bachian, Celebes.

***scutellata, Proconia*** Walker, 1851b : 786. Holotype ♂ with labels : " Type " and " 13. Proconia scutellata." and " 190 ". The original description, although not good, is believed to have been made from this specimen. Dr. Heinz Schröder had studied the specimen.

***scutellata, Tettigonia*** Distant, 1879b : 62. Lectotype ♀ with labels : " Type ; H. T." and " scutellata ; type Dist." and " Irazu, ; 6–7000 ft. ; H. Rogers." and " Distant Coll. ; 1911–383.". There is also a ♂ in the collection.

***semirasa, Tettigonia*** Fowler, 1899e : 245. Lectotype ♀ with labels : " Type " and " Tettigonia ; semirasa Fowler ; TYPE." and " Chilpancingo, ; Guerrero, 4600 ft. ; June. H. H. Smith." and the B.C.A. label. Of two ♀ glued to the same card, the lectotype is adjacent to the red mark I placed on the card. The lectotype is darker than the original illustration.

***semivitta, Tettigonia*** Walker, 1851b : 752. Holotype ♀ with labels : " Type " and " 58. Tettigonia semivitta." and " 622 ". This is the only specimen in the collection.

***separanda, Tettigonia*** Fowler, 1899e : 249. Lectotype ♀ with labels : " Type " and " Tettigonia ; separanda ; Fowler. TYPE " and " Omilteme, ; Guerrero, 8000 ft. ; July. H. H. Smith.". It is one of two ♀ glued to the same card and is adjacent to the red mark I placed on the card.

***septemguttata, Tettigonia*** Walker, 1851b : 104. Holotype ♀ with labels : " Type " and " 104. Tettigonia 7-guttata." and " E. Doubleday. ; St. John's Bluff, ; E. Florida.". It agrees with Young and Davidson's (1959a : 13) interpretation.

***signifera, Tettigonia*** Walker, 1857b : 168. Lectotype ♀ with labels : " Type " and " signifera Walk " and " Sar." and " Wallace " and " 68.4.". This is the only specimen in the collection. It is moulded.

***sikhimensis, Tettigoniella*** Distant, 1908g : 217. Lectotype ♀ with labels : " Type " and " Tettigonia ; sikhimensis ; type ; Dist." and " Sikkim.". The venter is moulded. There is an additional ♂ in the collection.

***similis, Tettigonia*** Walker, 1851b : 769. Holotype ♀ with labels : " Type " and " 96. Tettigonia similis." and " 21." and " 21.". This is the only specimen in the collection.

***sistens, Tettigonia,*** 1858a : 95. Lectotype ♂ with labels : " Type " and " sistens Walk " and " M. Video ; Bz " and " 68.4 ". The specimen is very teneral, moulded and the wings are damaged.

***sociata, Tettigonia*** Fowler, 1900a : 262. Lectotype ♀ with labels : " Type " and " Tettigonia ; sociata Fowler. ; TYPE " and " Bugaba, ; Panama. ; Champion." and the B.C.A. label. The lectotype is one of a pair of specimens glued to the same card. It agrees with the original illustration and with the original description of the banded form. The ♂ is entirely black except for a pair of anteapical costal spots on each fore wing.

***sororia, Tettigonia*** Fowler, 1900b : 272. Lectotype specimen without abdomen, with labels : " Type " and " Tettigonia ; sororia. Fowler. ; TYPE." and " Cuernavaca, ; Morelos. ; June. H. H. S." and the B.C.A. label. There is an additional ♂ which is doubtfully conspecific.

***spectabilis, Tettigoniella*** Distant, 1908a : 519. Lectotype ♀ with labels : " Type " and " Amblyscarta ; spectabilis ; type Dist." and " Toungas de la Paz. ; 1903–188.".

***spectanda, Tettigonia*** Fowler, 1900d : 285. Holotype ♀ with labels : " Type " and " Tettigonia ; spectanda ; Fowler. TYPE " and " Cent. Amer." and the B.C.A. label.

***spectra, Tettigoniella*** Distant, 1908g : 211. Lectotype ♀ with labels : " Type " and " spectra ; Dist." and " Ind. Mus." and " Sara Ghat ; 29–30/6/06 " and " Distant Coll. ; 1911–383.".

***spectralis, Tettigonia*** Fowler, 1899e : 256. Lectotype ♂ with labels : " Type " and " Tettigonia ; spectralis. Fowler. ; TYPE " and " Cerro Zunil, ; 4–5000 ft. ; Champion." and the B.C.A. label. There is an additional series of specimens in the collection.

***speculifera, Proconia*** Walker, 1851b : 790. Holotype ♀ with labels : " Type " and " 21. Proconia speculifera.". This is the only specimen in the collection.

***stella, Onega*** Distant, 1908a : 528. Lectotype ♂ with labels : " Type " and " Tettigoniella ; stella ; type Dist." and " Cotypes, Breddin. ; Purch. of Haensch, ; Tettigonia ; spec. nov." and " Baiza ; (Ecuad.) ; R. Haensch S." and " 123 " and " 1903–322.". It agrees with the original description except that the fore wings are quite coriaceous. It is the only specimen in the collection.

***stellaris, Aulacizes*** Walker, 1858b : 238. Lectotype ♂ with labels : " Type " and " Aulacizes stellaris." and " Mex.".

**stesilea, Diestostemma** Distant, 1908b : 83. Holotype ♂ with labels : " Type " and " Diestostemma ; stesilea ; type Dist." and " Graniplaya ; Bolivia ".

**stipata, Tettigonia** Walker, 1851b : 749. Holotype ♂ with labels : " Type " and " 52. Tettigonia stipata " and " Quito ". The shape of the anterior margin of the head is paraboloid, not semicircular as in the original description. The specimen is teneral. There is an additional specimen in the collection.

**subflava, Tettigonia** Walker, 1851b : 762. Holotype ♀ with labels : " Type " and " 80. Tettigonia subflava." and " Vene ; zuela ". This is the only specimen in the collection.

**subsignata, Tettigonia** Walker, 1858a : 96. Lectotype ♀ with labels : " Type " and " subsignata ; Walk." and " inclinans ". In the original description, the black spots between the eyes are simply the ocelli (not black). This is the only specimen in the collection. It is probably from the Western Hemisphere.

**sulphurata, Tettigoniella** Distant, 1908g : 216. Lectotype ♀ with labels : " Type ; H. T." and " Tettigoniella ; sulphurata ; type Dist." and " Ruby Mines ; (Doherty) " and " Distant Coll. ; 1911–383.". There is no unusual ridging on the pronotum. There is an additional ♂ in the collection.

**superflua, Tettigonia** Fowler, 1899d : 248. Lectotype ♂ with labels : " Type " and " Tettigonia ; superflua ; Fowler. TYPE " and " Omilteme, ; Guerrero ; 8000 ft. ; July. H. H. Smith.". The lectotype is one of a pair of specimens glued to the same card and is adjacent to a red mark I placed on the card. There are additional specimens, some of which are not conspecific with the lectotype, in the collection. The original was a composite description including the latter.

**sylvanella, Tettigoniella** Distant, 1918b : 3. Lectotype ♀ with labels : " Type " and " Tettigoniella ; sylvanella ; type Dist." and " Kodai Kanal ; S. India ; W. V. Campbell " and " S. India ; E. A. Butler ; 1915–60.". The specimen is teneral. There is an additional ♀ in the collection.

**taeniata, Tettigonia** Fowler, 1900a : 257. Lectotype ♀ with labels : " Type " and " Tettigonia ; taeniata. Fowler. ; TYPE." and " Bugaba, ; Panama. ; Champion." and the B.C.A. label. There is also a teneral ♂, used for the original illustration, in the collection.

**tamborensis, Tettigoniella** Distant, 1908f : 139. Lectotype ♀ with labels : " Type " and " Tettigoniella ; tamborensis ; type Dist." and " Tambora, Sambawa, ; Malay Archipelago. ; W. Doherty. ; 1903–31.".

**tapes, Amblydisca** Fowler, 1898a : 210. Lectotype ♂ with labels : " Type " and " Amblydisca ; tapes. Fowler ; TYPE." and " Sabo, ; Vera Paz. ; Champion." and the B.C.A. label. It is the only specimen in the collection.

**teliformis, Tettigonia** Walker, 1851b : 764. Lectotype ♂ with labels : " Type " and " 84. Tettigonia teliformis." and " E. Doubleday. ; Trenton Falls, ; New York.". It does not agree very well with the original description.

**tenebrosa, Proconia** Walker, 1851b : 787. Holotype ♀ with labels : " Type " and " 16. Proconia tenebrosa " and " E. Doubleday. ; St. John's Bluff, E. Florida.".

***tenella, Tettigonia*** Walker, 1851b : 770. Holotype ♂ with labels : " Type " and " N. Amer." and " Ent. Club. ; 44.12." and " 97. Tettigonia tenella.". It is the only specimen in the collection.

***teres, Tettigonia*** Fowler, 1900d : 287. Lectotype ♀ with labels : " Chilpancingo, ; Guerrero. ; 4600 ft. ; June. H. H. Smith." and " Type " and " Tettigonia ; teres Fowler. ; TYPE." and the B.C.A. label. It is one of two ♀ glued to the same card, and is adjacent to the red mark I placed on the card.

***terminalis, Aulacizes*** Walker, 1851b : 793. Holotype ♀ with labels : " Type " and " 8. Aulacizes terminalis." and " Brazil ".

***terminalis, Diestostemma*** Walker, 1851b : 798. Holotype ♀ with labels : " Type " and " 2. Diestostemma terminalis." and " Brazil " and " 612 ". The specimen is teneral.

***terminalis, Proconia,*** 1851b : 787. Lectotype ♂ with labels : " Type " and " 14. Proconia terminalis.".

***testaceus, Ciccus*** Walker, 1851b : 800. Holotype ♀ with labels : " Type " and " 7. Ciccus testaceus.". The specimen is teneral.

***testudinaria, Tettigonia*** Fowler, 1899e : 251. Lectotype ♂ with labels : " Type " and " Tettigonia ; testudinaria ; Fowler. TYPE " and " Bugaba ; 800–1,500 ft. ; Champion." and the B.C.A. label. The lectotype is one of three specimens glued to the same card and is opposite a red mark I placed on the card. The original illustration is poor.

***thalia, Tettigoniella*** Distant, 1918b : 2. Lectotype ♀ with labels : " Type " and " Tettigoniella ; thalia ; type Dist." and " Ind. Mus. ; Kurseong ; 6,000 ft. ; E. Himalayas ; 11–IX–09. ; D'Abreu " and " Distant Coll. ; 1911–383.". It agrees with the non-parenthetical portions of the original description, but the face is not flattened. The type series is mixed.

***thea, Tettigoniella*** Distant, 1908a : 520. Holotype ♂ with labels : " Type " and " Tettigoniella ; thea ; type Dist." and " Peru 263 ; Rosenberg. ; 1906–263.". This is the only specimen in the collection.

***tigrina, Kolla*** Distant, 1918b : 9. Lectotype ♂ with labels : " Type " and " Kolla ; tigrina ; type Dist." and " Kodai Kanal ; S. India ; Campbell." and " 604 " and " S. India. ; E. A. Butler. ; 1915–60.". The lectotype is between two red marks on the card bearing it and two additional specimens.

***timorensis, Tettigoniella*** Distant, 1908f : 139. Lectotype ♀ with labels : " Type " and " Tettigoniella ; timorensis ; type Dist." and " Wetter, near Timor, ; Malay Archipelago. ; W. Doherty. ; 1903–31.". There is an additional specimen, without abdomen, from Timor in the collection.

***tissa, Abana*** Distant, 1908b : 73. Lectotype ♂ with labels : " Type " and " Abana ; tissa ; type Dist." and " Cachabé ; low c., XII. 96. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.". There is also a topotypic ♂ in the collection.

***tolosa, Tettigoniella*** Distant, 1908a : 521. Lectotype ♂ with labels : " Type " and " Tettigoniella ; tolosa ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.".

***tomentosa, Oncometopia*** Distant, 1908b : 67. Lectotype ♀ with labels : " Type " and " Oncometopia ; tomentosa ; type Dist." and " Equador. ; Rosenberg. ;

99–104." and " Chimbo, ; 1000′. VIII. 97. ; (Rosenberg)." and " Tretogonia JTM ".

***transfuga, Tettigonia*** Fowler, 1899d : 247. Lectotype ♀ with labels : " Type " and " Tettigonia ; transfuga. Fowler. ; TYPE." and " Omilteme, ; Guerrero, 8000 ft. ; July, H. H. Smith." and the B.C.A. label. The scutellum is not black-margined as in the original description, but is as in the original illustration. There is an additional ♀ and a teneral ♂ in the collection.

***tripars, Tettigonia*** Walker, 1857a : 97. Lectotype ♀ with labels : " Type " and " tripars Walk " and " Malch " and " Wallace " and " 68.4 ".

***triplaga, Aulacizes*** Walker, 1858a : 100. Holotype ♂ with labels : " Type " and " Para " and " triplaga Wlk.".

***tripuncta, Tettigonia*** Walker, 1870b : 303. Lectotype ♂ with labels : " Type " and " tripunctata " and " Wallace " and " Cer." and " 68.4.". The face and the genitalia are damaged. The specimen is teneral.

***trivirgata, Tettigonia*** Fowler, 1900a : 259. Lectotype ♂ with labels : " Type " and " Tettigonia ; trivirgata. ; Fowler. TYPE " and " Bugaba, ; 800–1,500 ft. ; Champion." and the B.C.A. label. Of two ♂ glued to the same card, the lectotype is adjacent to a red mark I placed on the card. There is an additional ♂ in the collection.

***tunicata, Tettigonia*** Fowler, 1900b : 271. Lectotype ♀ with labels : " Type " and " T. tunicata ; Fowler. TYPE." and " Chilpancingo, ; Guerrero, 4600 ft. ; June. H. H. Smith." and the B.C.A. label. The lectotype is one of two specimens on the same card and is adjacent to the red mark I placed on the card. The original description is poor, the original illustration worse. There is an additional ♂ in the collection.

***typicus, Augulus*** Distant, 1918b : 99. Lectotype specimen without abdomen, with labels : " Type ; H. T." and " Augulus ; typicus ; type Dist." and " Margherita ; Assam ; W. Doherty ". This is the only specimen in the collection.

***ulla, Tettigoniella*** Distant, 1908a : 522. Lectotype ♂ with labels : " Type " and " Tettigoniella ; ulla Dist. ; type " and " Peru. ; Rosenberg. ; 1906–263.". This is the only specimen in the collection.

***undecimmaculata, Tettigonia*** Fowler, 1899e : 254. Holotype ♀ with labels : " Type " and " Tettigonia ; undecimmaculata ; Fowler. TYPE " and " V. de Chiriqui, ; 2–3000 ft. ; Champion." and the B.C.A. label. This is the only specimen in the collection.

***uniguttata, Tettigonia*** Walker, 1851b : 778. Holotype ♀ with labels : " Type " and " 115. Tettigonia uniguttata." and " Mexico ". The specimen is very teneral.

***vallonia, Tettigoniella*** Distant, 1908a : 522. Lectotype ♂ with labels : " Type " and " Tettigoniella ; vallonia ; type Dist." and " Peru. ; Rosenberg. ; 1906–263.".

***velutina, Tettigonia*** Fowler, 1899e : 251. Lectotype ♀ with labels : " Type " and " Tettigonia ; velutina. ; Fowler. TYPE " and " Bugaba, ; 800–1,500 ft. ;

Champion.". The original description is composite, one of the three specimens in the type series not being conspecific. There is a conspecific ♀ in the collection.

***venosula, Oncometopia*** Distant, 1908b : 64. Holotype ♂ with labels : " Type " and " Oncometopia ; venosula ; type Dist." and " Co types, Breddin. ; Purch. of Haensch. ; Oncometopia ; venosula ; M. S. Bredd." and " Archidona ; (Ecuad.) ; R. Haensch S." and " 1903–322." and " 93 ".

***vesta, Kolla*** Distant, 1908g : 224. Lectotype ♀ with labels : " Type ; H. T." and " vesta ; type Dist." and " Kangra Valley ; 4500 ft. ; May 1899 ; Dudgeon." and " Distant Coll. ; 1911–383.". This is the only topotypic specimen in the collection.

***virescens, Oncometopia*** Distant, 1908b : 65. Lectotype ♀ with labels : " Type " and " Oncometopia ; virescens ; type Dist." and " Peru ". There is an additional ♀, mentioned in the original description, which is doubtfully conspecific.

***virgaticeps, Tettigonia*** Fowler, 1900c : 275. Lectotype ♀ with labels : " Type " and " Tettigonia ; virgaticeps Fowler. ; TYPE." and " Teapa ; Tabasco. ; April. H. H. S." and the B.C.A. label. There is an additional ♀ in the collection.

***viridescens, Tettigonia*** Walker, 1851b : 765. Holotype ♀ with labels : " Type " and " Tettigonia viridescens." and " Vene ; zuela ".

***viridivittata, Aulacizes*** Walker, 1851b : 794. Holotype ♀ with labels " Type " and " 9. Aulacizes viridivitta." and " Para ".

***vittifrons, Tettigonia*** Walker, 1870b : 302. Lectotype ♀ with labels : " Type " and " vittifrons " and " N " and " N. Gui ; Wallace ".

***wallacei, Tettigoniella*** Distant, 1908f : 143. Lectotype ♀ with labels : " Type " and " Tettigoniella ; wallacei ; type Dist." and " Mys. ; Wallace " and " M." and " 68.4 ". Except that the flattening of the face is negligible and that the facial muscle impressions are very weak, the specimen agrees with the original description. This is the only specimen in the collection.

***wetterensis, Tettigoniella*** Distant, 1908f : 137. Lectotype ♀ with labels : " Type " and " Tettigoniella ; wetterensis ; type Dist." and " Wetter, near Timor, ; Malay Archipelago ; W. Doherty. ; 1903–31.". The abdominal sternum vii is somewhat distorted. The specimen is teneral.

***whiteheadi, Tettigoniella*** Distant, 1908f : 142. Lectotype ♂ with labels : " Type " and " Tettigoniella ; whiteheadi ; type ; Dist." and " Philippine Is. ; Whitehead. ; 96–147.".

***willeyi, Tettigonia*** Kirkaldy, 1905b : 333. Lectotype ♀ with labels : " Tettigonia willeyi " and " Type [in blue] " and " New Britain ; A. Willey, D. Sc. ; Reg. Mar. 1. 1898 " and " Type [in red] " and " Brit. Mus. ; 1950–82 " and " Tettigonia willeyi ; Kirk. Type.". There is another specimen in the collection.

***zea, Diedrocephala*** Distant, 1908b : 60. Holotype specimen without abdomen, with labels : " Type " and " Diedrocephala ; zea ; type Dist." and " Cachabé ; low c., XII. 96. ; (Rosenberg)." and " Ecuador. ; Rosenberg. ; 99–104.". The abdomen, hind wings and metathorax are missing. This is the only specimen in the collection.

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# DIPTERA FROM NEPAL

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## BOMBYLIIDAE

J. BOWDEN

## ASIATIC SPECIES OF THE GENUS *STENOMICRA* (ANTHOMYZIDAE)

C. W. SABROSKY

## PSYCHODIDAE

F. VAILLANT

## CELYPHIDAE

P. VANSCHUYTBROECK

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BY
J. BOWDEN
Research Station, Long Ashton, Bristol

Xnf

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BY
C. W. SABROSKY
Entomology Research Division, Agr. Res. Surv.,
U.S. Dept. Agric., Washington, D.C.

# PSYCHODIDAE

BY
F. VAILLANT
University of Grenoble, France

# CELYPHIDAE

BY
P. VANSCHUYTBROECK
Bruxelles

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# DIPTERA FROM NEPAL

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# BOMBYLIIDAE

*By* J. BOWDEN

SYNOPSIS

From material collected on the British Museum East Nepal Expedition 1961–1962, *Cyrtosia amnicola* and *Hemipenthes melanus* are described as new ; both represent first records of their genera from the area. *Cephenius mucronatus* Enderlein and *Cephenius sikkimensis* Enderlein are redescribed. *Ceratolaemus* Hesse, erected as an aberrant subgenus of *Platypygus* Loew is synonymized with *Cyrtosia* Perris.

SEVEN specimens of Bombyliidae collected by Mr. R. L. Coe while serving as entomologist on the British Museum East Nepal Expedition 1961–1962 comprise four species, belonging to three genera, each in a separate subfamily ; two of the species are new. The new species, a *Hemipenthes* and a *Cyrtosia* have strong Palaearctic affinities, while the other species, belonging to *Cephenius*, were both previously known from neighbouring Sikkim.

## Subfamily **CYRTOSIINAE**

## ***CYRTOSIA*** Perris

*Cyrtosia* Perris, 1839, *Ann. Soc. ent. Fr.* **8** : 55.
*Ceratolaemus* Hesse, 1938 : 969 **syn. n.**

Twenty-four species of this genus are listed by Engel (1937) from the Palaearctic region. Although *Cyrtosia* has not previously been recorded from the oriental region or from Asia other than Turkmen and Uzbek S.S.R., it is very likely that the genus will occur widely in Central Asia.

### ***Cyrtosia amnicola*** **sp. n.**

*Head:* occiput shining brown-black to black, with short sparse black hair and strongly inflated, lower posterior angle strongly produced backwards into a sharp triangular projection ; ocelli prominent, red ; frons depressed, shining blackish, edges of frons, band above antennae, face, genae and buccal cavity yellow, buccal margin blackish brown to black ; antennae black, second segment with pale apical margin, third broadly oval pale pubescent on inner margin and with a broad apical style which is notably pubescent ; proboscis black, finely hairy, palps apparently absent. *Thorax* black, mesonotum shining ; humeri broadly, metapleurae and wing base areas pale yellowish, propleurae and a band across upper sternopleurae and hypopleurae also pale yellowish, pleurae thus appearing black with upper and median pale yellow stripes ; thoracic pubescence sparse, dark, notopleurae with 2–3 longish dark hairs, and 3 long, more bristly pre-alar hairs ; hair across anterior margin of mesonotum and on humeri pale ; notum and pleurae densely covered with minute rather iridescent scales. *Abdomen* black, shining, tergites with narrow pale yellow posterior margins, lateral intersegmental areas yellow at base of abdomen, venter black with yellowish hind margins to segments ; hypopygium black ; pubescence sparse, black. *Legs* almost entirely pale yellow, coxae slightly brownish basally, last three segments of each tarsus brownish black ; middle femora sometimes slightly brownish basally, hind legs sometimes with femora and tibiae brownish apically ; claws black, pulvilli white ; pubescence on legs apparently all pale. *Wings* iridescent ; venation typical, anal vein rather strongly irregular before margin ; veins brownish, microtrichiae pronounced, those along hind margin well developed ; alula absent ; halteres comparatively large, stalk flattened ; mainly yellowish, stalk and base of knob more or less infuscate.

Length of body 1·6–2·0 mm. ; of wing 1·8–2·3 mm. ; of proboscis 0·7–1·0 mm.

Holotype ♂. EAST NEPAL: Taplejung District, Dobhan, *c.* 3,500 ft, small pockets of plants on arid slopes above R. Maewa, 2.i.1962 (*R. L. Coe*). Brit. Mus. (Nat. Hist.).

Paratypes : 1 ♂, same date as holotype ; 2 ♂, Taplejung District, Dobhan, *c.* 3,500 ft, shady places on shrubby slope above R. Tamur, 21–27.i.1962 (*R. L. Coe*). Brit. Mus. (Nat. Hist.) and author's collection.

*C. amnicola* runs easily in Engel's key (1937 : 105) to *C. nitens* Loew, with which species it agrees in important characters such as the ventrally prolonged head and long proboscis, but is readily separated by differences in colour, such as black antennae, more extensively black buccal area, less extensive yellow mesonotal pattern, the distinctive median yellow pleural line, and paler pubescence on legs.

It may be noted here that Hesse (1938 : 969) proposed a subgenus *Ceratolaemus* for a South African species *xanthogrammus* Hesse, which he considered belonged to the genus *Platypygus* Loew. *Ceratolaemus* was differentiated on the absence of a discoidal cell, present in all other species of *Platypygus*, and was separable, according to Hesse, from *Cyrtosia* by several characters, particularly the ventral prolongation of the head behind, longer proboscis, and well developed wing microtrichiae. In fact, none of these characters differentiate *Ceratolaemus xanthogrammus* from *Cyrtosia* as at present constituted, while the open discoidal cell, if this character be accepted as a generic distinction, precludes its allocation to *Platypygus*. *P. xanthogrammus* Hesse should therefore be known as *Cyrtosia xanthogramma* (Hesse) **comb. n.**, and placed in the *C. nitens* group, which also includes *C. amnicola* and several Mediterranean species. *Ceratolaemus* Hesse drops into the synonymy of *Cyrtosia* Perris, at least until a comprehensive revision of the Cyrtosiinae has been carried out.

## Subfamily **SYSTROPINAE**

### ***CEPHENIUS*** Enderlein

*Cephenius* Enderlein, 1926, *Wien. ent. Ztg.* **43** (2) : 70.

With the exception of *Systropus annulatus* Engel, 1937, all the non-African Old World species of this subfamily are placed in the genus *Cephenius* Enderlein, type-species *Systropus studyi* Enderlein from China. *Cephenius* was separated from *Systropus* on the grounds that the eyes are contiguous, not narrowly separated, in both sexes. This is not a generic character in the Systropinae and there are no other grounds for maintaining *Cephenius* separate from *Systropus*. Since the type-species of *Systropus* Wied., as well as those of most of the other genera erected by Enderlein (1926*a*) are African, the formal synonymy of *Cephenius* Enderlein and *Systropus* Wiedemann is best established in a treatment of the African fauna. This will be done in a subsequent contribution. Meanwhile the name *Cephenius* is retained for the two specimens considered here, each representing one of Enderlein's species and both previously known from Sikkim. As the original descriptions are rather less than adequate, the opportunity is taken to redescribe both.

## ***Cephenius mucronatus*** Enderlein

*Cephenius mucronatus* Enderlein, 1926*a* : 82 ; Engel, 1937 : 92.

*Head:* occiput black, densely white-dusted, especially on lower edges, and clothed with pale yellowish to white hair ; ocellar tubercle brownish ; interocular stripe black ; frons, antennal tubercle, face, genae, buccal margin and cavity yellow, more or less densely silvery pollinose, facial hair longish, not dense, yellowish white ; antennae with first segment for most part brown, yellow at base, black at apex, second and third segments black, pubescence all black, antennal length about 5 mm., proportions 2·5 : 1 : app. 2·0 ; proboscis black, brownish basally, palps yellowish brown. *Thorax* with prominent black-and-yellow pattern ; mesonotum black, humeri and a broad oblique stripe extending well onto mesonotum, anterior half of teguliform lobe, post alar calli broadly, yellow, mesonotum slightly rugose ; pleurae with entire propleural region, most of hypopleurae and metapleurae and upper anterior sternopleurae, together with a broad median metasternal stripe yellow, rest of pleurae and sides of metasternum black, pubescence of thorax short, sparse, dark on black areas, pale, white to yellowish, on yellow areas, pteropleurae with weak tuft of shining yellowish hair ; scutellum black, extreme margin and apex beneath yellow, pubescence black but marginal fringe yellow, scutellar callosities clear yellow, foliate. *Abdomen* with petiole consisting of segments II–V, the latter broadening fairly sharply into club of VI onwards ; I black, II–V ochraceous yellow with broad blackish brown dorsal stripe and narrower ventrolateral brownish stripes ; club brownish yellow, hind margins of segments ochraceous yellow, last sternite entirely so ; pubescence generally black, short, rather sparse, white in ventro-lateral tufts of I, yellow to more or less gold on yellow parts of petiole and on apex at sides and below on margins of club ; posterior fringe of VIII long, fine, yellowish ; ovipositor shining black, semicircular with a median, prominent, sharply pointed, slightly upturned process which has a few prominent apical hairs. *Legs* apparently black-and-yellow banded ; anterior coxae and trochanters entirely yellow, other coxae and trochanters black, femora yellow, extensively brownish above basally, hind pair for most of their length, brownish areas with dense serially arranged black spicules giving appearance of black colour to femora above ; tibiae all yellow but basal halves of hind tibiae densely covered with black spicules, thus appearing black in colour ; tarsi yellow, apical two segments of each tarsus black and basal segment of hind tarsi also densely black spiculate, appearing black basally ; claws black, pulvilli yellowish ; callus of fore femora brownish, minutely pubescent ; fore and mid tibiae with short silvery pubescence, which is not conspicuous or dense ; femora without spines, those on hind tibiae arranged 6, 7, 3. *Wings* brownish subhyaline, yellowish in subcostal cell and slightly yellowish at base and in first basal cell ; veins brownish, *Sc* and $R_1$ yellowish ; with two submarginal cells, discal cross-vein well beyond middle of discal cell, origin of $R_4$ very steep, first posterior cell narrowed at apex ; halteres with brownish yellow stem, yellow knob which is black above near stem.

Length 20–22·5 mm. ; wing 12·5–15 mm. (these figures include those given by Engel, 1926*a*) ; proboscis about 4·5 mm.

NEPAL : Taplejung District, Sangu, *c.* 6,200 ft., by rocky stream, 7–16.x.1961, 1 ♀ (*R. L. Coe*). Brit. Mus. (Nat. Hist.).

### *Cephenius sikkimensis* Enderlein

*Cephenius sikkimensis* Enderlein, 1926*a* : 78 ; Engel, 1937 : 95.

*Head:* occiput black, densely white pollinose, except for three (one median, paired submedian) vertical stripes, which are clear black, pubescence white ; ocellar tubercle reddish, ocelli yellow, interocular stripe greyish black ; frons, face, genae, buccal margin and cavity and head beneath yellow, all except buccal area and head beneath densely silvery pollinose, facial tuft longish, but not dense, white ; antennae with first segment largely yellow, black at apex, second and third black, pubescence all black, antennal length about 4·5 mm., proportions 2–2·5 : 1 : 2 ; proboscis black, brownish below at base, palps yellowish. *Thorax* mainly black, humeral area and a large oblique stripe running well onto mesonotum, anterior half of teguliform lobes, post alar calli broadly, entire propleural area and metapleurae yellow, upper anterior margin of metasternum also dark yellowish, scutellum black ; pubescence mainly white, pronotal hair, a broad band along mesonotum, a tuft at upper sternopleural angle and hair at base of scutellum black, a small hair tuft present on pteropleurae, pubescence on metasternum distinctly long and shaggy although sparse ; scutellar callosities clear yellow, foliate. *Abdomen* with petiole consisting of segments II–V, latter not greatly expanded at apex, club laterally compressed ; colour predominantly yellow, clear sulphury yellowish at base of petiole, becoming reddish yellow on club, I all black, a broad dorsal brownish black stripe on petiole which extends broadly onto VI, II–V also with latero-ventral black stripes extending along greater part of each segment but not reaching either margin ; pubescence short, sparse, predominantly black, sides of petiole with golden yellow hair which extends as a narrow band along lower margin of club, on VIII occupying most of ventral part ; genitalia reddish yellow, last sternite (tergite as viewed *in situ*) with heavily sclerotised lamellae, and produced at each ventral corner (as viewed *in situ*) into long thin whip-like processes ; telomeres with simple rounded but heavily sclerotised apices, aedeagal process ending in a very broad heavily sclerotised formation. *Legs:* anterior coxae and trochanters yellow, mid coxae black basally, yellow at apices, hind coxae black, fore and hind coxae with white pubescence, mid coxae with short black hair ; fore legs yellow, a posterodorsal basal area on femora brownish and densely covered with black spicules, callus brown, minutely black pubescent, otherwise femora, tibiae and basal three segments of tarsi clothed with short, sparse silvery pubescence, last two tarsal segments brownish yellow with black hairs ; mid legs similar, but femora with more extensive posterodorsal brownish area densely covered with shining black spicules, tibiae with some black spicules anteriorly, last three tarsal segments blackish brown and black haired ; hind legs with femora yellow, brownish above almost to apex, densely covered on brown areas with black spicules, tibiae yellow, with dense black spicules above on more than basal half and also medially as a complete ring, basal segment of tarsi with such dense black spicules above that it appears black though ground colour is yellowish brown, other tarsal segments similar although less densely spiculate so that yellowish brown to brown ground colour is more apparent ; all claws black, pulvilli whitish ; femora without spines, those of hind tibiae strong, 3, 5, 4. *Wings* hyaline, slightly shaded yellowish at base and in costal cell ; veins brownish ; with two submarginal cells, discal cross vein at about half length of discoidal cell, origin of $R_4$ steep, first posterior cell only slightly narrowed at apex ; halteres with dusky yellowish stem and pale yellow knob.

Length 14·5–17·0 mm. ; wing 10·0–11·0 mm. (these figures include those given by Engel, loc. cit.) ; proboscis about 3 mm.

NEPAL : Taplejung District, Sangu, *c.* 6,200 ft., mixed vegetation by stream in gully, ix.–x.1961, 1 ♂ (*R. L. Coe*). Brit. Mus. (Nat. Hist.).

The differences between the above description and that of Enderlein's much briefer original description, particularly in regard to the legs, are due to the superficiality of Enderlein's description. A great many species of *Cephenius* have the very characteristic rows of spicules on the legs so dense that the ground colour may be obscured, large areas of the legs thus appearing black when in fact the ground colour may be pale yellow or brownish. *C. sikkimensis* is a good example; the ground colour of the legs is predominantly yellow, all the apparent black being due to very dense spicules.

## Subfamily **EXOPROSOPINAE**

### ***HEMIPENTHES*** Loew

*Hemipenthes* Loew, 1869, *Berl. ent. Z.* **13**: 28 nota.

This genus, which has numerous Asiatic representatives, has not previously been reported from the Southern; Oriental side of the Himalayas. The present collection contains a single specimen representing a distinct species of the *velutinus* Mg. group.

### ***Hemipenthes melanus*** **sp. n.**

(Text-fig. 1)

*Body* black, sides of abdomen, hind margin of abdominal segment VI and all VII and VIII somewhat brownish. *Head:* frons about twice width of ocellar tubercle; antennae with first segment about three times as long as second, combined length slightly less than that of third, latter with bulb-shaped base rather abruptly narrowing at about one-fifth length of segment into apical part, apical style short, transparent reddish; proboscis short, not extending much beyond bases of antennae, palps short; face slightly produced, appearing more prominent because of short proboscis. *Pubescence* almost entirely black, some pale yellowish scales on lower frons and face, collar pale straw-yellow, anterior part of plumula dirty white; no trace of white hair or scales on abdomen, even at sides of I, hair and scales on sides of abdomen long, those at sides of V and VI, especially, markedly tufted, those on posterior half of III and on IV less so, posterior scale fringe of VII long; ovipositor spines delicate, fairly long, reddish basally, transparent yellowish at apices, 6 + 6. *Legs* yellow, coxae and tarsi, except for basal segments, black or blackish; scales on femora and mid and hind tibiae dense, black, spines and spicules all black; claws strongly swollen at bases, but without discrete tooth, pulvilli absent. *Wings* (Text-fig. 1) with extensive deep blackish brown baso-marginal infuscation, characterised by its extension to wing tip in second submarginal cell, the marginal cell completely infuscate except for a small clear subapical spot; yellowish brown fenestrae over cross-veins and bifurcations; venation as for genus, with deep loops in $R_{2+3}$ and $R_4$, discal cell slightly widened at apex and very obtuse, first posterior cell and anal cell widely open; squamae dirty white, black edged and black fringed, halteres with dusky stem, knob blackish below, dusky white above.

Length 8·8 mm.; wing 9·5 mm.

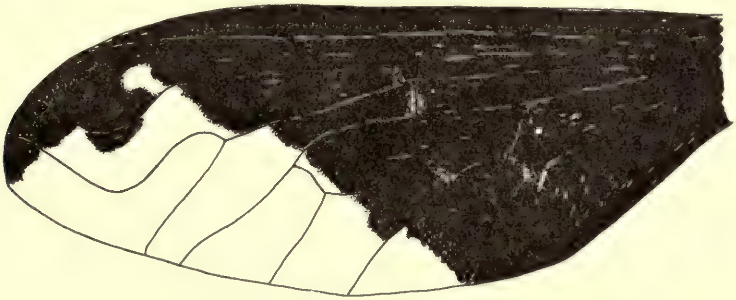

FIG. 1. *Hemipenthes melanus* sp. n. Holotype ♀ wing.

Holotype ♀. NEPAL: Arun Valley, below Tumlingtar, River Sabhaya, west shore, *c.* 1,800 ft., evergreen shrubs on sandy shore, 9–18.xii.1961 (*R. L. Coe*). Brit. Mus. (Nat. Hist.).

*H. melanus* is easily separable from *H. velutinus* and *H. praecisus* Loew, to which it appears to be closest, by the characteristic wing infuscation with its extension along the costal margin to the wing tip, and by the entirely black abdomen.

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# ASIATIC SPECIES OF THE GENUS *STENOMICRA* (DIPTERA : ANTHOMYZIDAE)

*By* C. W. SABROSKY

## SYNOPSIS

*Stenomicra* Coquillett, a genus of tiny, inconspicuous, and uncommon flies, is represented in the collection of the British Museum East Nepal Expedition by one widespread species, *S. fascipennis* Malloch, and one new species, *S. angustiforceps*. Two other Asiatic species, *S. albibasis* (Japan) and *S. argentata* (Malaya), from the collection of the U.S. National Museum, are also described as new. A key to the 4 species, a detailed generic description, and a critical discussion of certain characters are included.

THE genus *Stenomicra* was erected by Coquillett in 1900 for a single, delicate species from Puerto Rico. In 1927 Malloch added three species—from Australia, the Philippines, and Hawaii. Species described in new genera by Czerny (1929) from Ceylon and by Collin (1944, 1951) from England and Fiji have been recognized subsequently as belonging to *Stenomicra*. Finally, Hennig (1956) added three new species from Costa Rica. The genus has thus come to be known as widespread but rather uncommon. In the past few years, however, many more specimens of these pale, tiny, easily overlooked flies have been collected. There are a number of undescribed species, chiefly from the Neotropical Region, but also from Australia, Micronesia, the Orient, the United States, and South Africa. Incidentally, the genus has not hitherto been known from Africa, but at least two new species have been found in material received from B. R. Stuckenberg of the Natal Museum.

The collection made by the British Museum East Nepal Expedition contained 25 specimens of two species of this genus, collected by Mr. R. L. Coe, to whom I am indebted for the privilege of studying the material. One of the species is here described as new, together with species from Japan and from Malaya.

I have followed Sturtevant (1954) and Hennig (1958) in placing *Stenomicra* in the family Anthomyzidae. In the past, the genus has also been referred to the Drosophilidae, Asteiidae, Geomyzidae, and Periscelididae.

The lengthy generic diagnosis is based on a review of all the species available to me, and not merely on the Oriental species. The broad consideration is essential, because one may be unduly impressed by the development of certain characters if he knows only one or a few species. Even though the genus throughout the world appears to be divisible into two groups of species on the basis of the characters used in the first couplet of the key, I do not feel that these groupings represent genera or even subgenera. In the number of species now known to me, mostly still undescribed, various

Bull. Brit. Mus. (Nat. Hist.), Entom., **17** (5), 1965.

combinations of characters can be found, and there are species clearly intermediate between the species groups (e.g. *S. argentata* sp. n.).

There is considerable question whether the apparent " vibrissae " of *Stenomicra* are actually that, or whether some other bristles are developed as what might be termed " pseudovibrissae." The small size of the species and the differences in fusion of parts of the face make study and interpretation rather difficult. A project of sufficient breadth to be worthwhile should involve consideration of these bristles and areas in such genera as *Anthomyza, Planinasus, Geomyza, Aulacigaster, Camilla, Periscelis*, etc., and is beyond the scope of this paper. Such a study may well be relevant to a review of the family relationships of *Stenomicra*, necessarily left in abeyance for the present.

There is also a question whether the characteristic proclinate bristles on the vertex are postverticals or inner verticals. In either case, the proclinate direction is unusual and is one of the distinctive features of the genus. Hendel (1931) and Collin (1944) called them postverticals, but Malloch (1927) regarded them as inner verticals. Hennig (1958 : 635) also concluded that they are inner verticals, and I agree. Many of the species also have weak but distinct hairs behind and below the ocellar triangle, in the same position as the postverticals of the Anthomyzidae with which *Stenomicra* is currently associated. I therefore conclude that they are indeed postverticals and that the strongly developed bristles on the rim of the vertex are inner verticals.

The species of *Stenomicra* show varying degrees of reduction in several characters. These reductions, which are sometimes quite extreme, materially affect a statement of generic characters and must also be considered in any discussion of the family position of the genus.

The postverticals, when discernible, are minute, weak, and hairlike. In some species, such as the type-species, *S. angustata* Coquillett from Puerto Rico, the postverticals are divergent. In other species they are convergent, though not cruciate as in *Anthomyza* for example. In a few species, such as the widespread *S. fascipennis* Malloch, I have been unable to find them. Even when present, they are difficult to see, especially as they are so often pale yellow gainst a yellow background.

In the wing, presence of the anal cell, presence of the anal vein, and separation or confluence of the second basal and discal cells appear to be related to the width of the wing on its basal portion. Narrowing of the wing tends to reduce the veins and cells in that area. In *Stenomicra*, the range is from all cells distinct, through varying degrees of incomplete closure, to complete confluence of second basal and discal cells and absence of anal cell. The anal vein in its most reduced form is only a trace, so close to the basal portion of the second basal cell that with usual examination one would say it was absent. With these reductions, the axillary lobe is undeveloped and the alula is absent or very narrow and lacks the usual fringe of hairs.

In two species (e.g., see Text-fig. 2), the wing is broader at its base, the axillary lobe is somewhat developed, and the alula is slightly broader than usual and has a fringe of long hairs. Although these features might be regarded as having generic significance, the similarity of the two species to other species of *Stenomicra* is so great in most respects that I leave them in the genus as atypical forms. Also, even though the wing is broad at base in these two species, the second basal and discal cells are completely confluent and the anal cell is absent. However, the anal vein is strong and extends half way to the margin of the wing.

## ***STENOMICRA*** Coquillett

*Stenomicra* Coquillett, 1900 : 262. Type-species, *S. angustata* Coquillett, by original designation.
*Podocera* Czerny, 1929 : 93. Type-species, *P. ramifera* Czerny, by monotypy.
*Stenomicra* Coquillett ; Hendel, 1931 : 10–12. [*Podocera* = *Stenomicra* ; generic redescription.]
*Diadelops* Collin, 1944 : 265–266. Type-species, *D. delicata* Collin, by monotypy.
*Stenomicra* Coquillett ; Sturtevant, 1954 : 560. [*Diadelops* = *Stenomicra*.] Hennig, 1958 : 633–635. [Generic characters, relationship.]

Small flies, usually 1·5–1·75 mm., with slender body. Head wider than thorax, strongly concave behind, the vertex a sharp rim above vertical occiput, in profile the head peculiarly angulate below, snoutlike, projecting forward at vibrissal angle ; eyes microscopically sparsely pubescent, in profile more or less diagonal and the length greater than the breadth, with some enlarged facets either above or below. Front devoid of hairs, depressed and emarginate anteriorly, parallel-sided above but widening at level of antennae, the face narrowing at the vibrissal angle, the eyes obviously closer together at the vibrissal angle than at the vertex, their inner margins appearing more or less emarginate at level of antennae; ocellar tubercle small, situated well in front of the vertex, commonly centred on the front. Face sloping anteroventrally from bases of antennae to vibrissal angles, usually with slight median carina, smooth in a few species, wide above and narrowing below ; vibrissal angles prominent, especially in profile, the lower end of the facial plate often forming a sharp rim above the vertical epistomal area which is continued around the oral opening as a broad to narrow peristomal area ; median plate of clypeus a long, narrow, inverted U. Haustellum and labella broad and short, tending to fill the oral opening. Palpi reduced, papilliform, difficult to discern. Antenna with large second segment, the third decumbent almost at right angles to second, and with many long hairs dorsally ; arista with several long rays dorsally near base, followed by alternating rays as in *Drosophila*. Chaetotaxy of head ; long, slightly reclinate outer verticals, weak to medium strong proclinate inner verticals, rather widely separated from the outer bristles, minute and hairlike postverticals (divergent in type-species, apparently convergent or absent in some species), no ocellars, 1 strong and long orbital, preceded by a shorter " preorbital " which may be weak and hairlike, or somewhat longer and stronger, at its maximum development almost as strong as the orbital ; true vibrissae apparently absent, but uppermost pair of facial bristles developed as porrect and slightly dorsoclinate and divergent " pseudovibrissae," followed posteroventrally on each side by a row of peristomal hairs and bristles.

Mesonotum longer than broad, almost bare of hairs, typically with only the median acrostichal and the two dorsocentral rows, the former incomplete posteriorly, the latter terminating with the dorsocentral bristles. Scutellum conical, rounded distally. Postscutellum strongly developed, convex, nearly or quite attaining apex of scutellum. Meso- and pteropleura usually bare. Chaetotaxy : 1 weak humeral, 1 presutural (posthumeral), 1 + 1 notopleural, the posterior on a callosity and well removed from notopleural rim, 1 or 2 dorsocentrals, 1 sternopleural, 1 apical scutellar.

Abdomen slender and elongate, usually seven terga visible in addition to the genital segments ; sterna becoming broader distally, the seventh segment a complete ring.

Fore femur with 1 or more strong, straight posteroventral bristles on distal half. Mid tibia apically with strong, straight, ventral spur.

Wing long and relatively narrow, usually narrowed at base with alula absent or very narrow and lacking fringe of hairs ; costa extending to apex of fourth vein ; subcosta incomplete, first vein very short, second usually very long ; third and fourth veins parallel to subparallel, often slightly converging at apex of wing, narrowing the apical cell ; fifth vein not reaching margin of wing ; second basal and discal cells distinct, partially separated, or confluent ; anal cell and anal vein variable, ranging from distinct to absent.

### KEY TO SPECIES

1 Second vein long, ending near apex of wing, the third costal sector (between tips of second and third veins) slightly shorter than fourth sector (Text-fig. 1) ; discal cell long, broadened distally ; postvertical hairs absent ; preorbital bristles strong, long or moderately so . . . . . . . . . . . . . . 2

– Second vein ending well before apex of wing, the third costal sector several times the length of fourth sector (Text-figs. 2, 3) ; discal cell short and parallel-sided, or weakly broadened ; postvertical hairs present ; preorbitals short, weak, hairlike 3

2 Wing with conspicuous white bands over the crossveins, in addition to white basal area . . . . . . . . . . . . . . . ***fascipennis*** Mall.

– Wing brownish hyaline, white only at base (Text-fig. 1) . . . ***albibasis*** sp. n.

3 Wing lightly browned, marked with white (Text-fig. 2) ; mesonotum polished yellow . . . . . . . . . . . . . . ***argentata*** sp. n.

– Wing entirely hyaline, unmarked ; mesonotum thinly pollinose, yellow with bluish gray infuscation laterally . . . . . . . . ***angustiforceps*** sp. n.

## *Stenomicra fascipennis* Malloch

(Text-fig. 4)

*Stenomicra fascipennis* Malloch, 1927 : 26, pl. 2, figs. 10, 11 [Philippines].
*Podocera ramifera* Czerny, 1929 : 94, figs. 1, 2 [Ceylon]. Probable syn.
*Diadelops distinctipennis* Collin, 1951 : 47, fig. 1 [Fiji]. Probable syn.

Bluish-grey, pollinose species, with conspicuously white-banded wings.

♂♀. Head and thorax brown in ground color, chiefly bluish gray pollinose ; head paler and partly yellowish, as described for *P. ramifera*, in teneral specimens, and antennae and proboscis yellow ; mesonotum broadly bright gray pollinose between dorsocentral lines, brownish on sides and scutellum, the latter sometimes yellowish apically ; pleuron brown across upper third, yellowish below ; abdominal terga and genital segments of both sexes subshining brown, thinly gray pollinose ; legs yellow except infuscated distal segment of fore and mid tarsi and basal fourth to third of hind tibia ; halteres apparently typically brownish on outer surface, but varying considerably in appearance, probably with degree of maturity of specimen ; wing brownish hyaline, darker behind the third vein, marked with a white basal area, a white band over each crossvein, and in some specimens white areas subapically in marginal and second posterior cells.

Front at vertex 1·5 times the width of an eye ; in profile, eye moderately diagonal, with greatest width opposite antennal base, so that its length is only 1·7 times the greatest width ; face nearly straight, less produced than in some species, the vibrissal angle oblique and not strongly snoutlike ; face with low median carina ; postverticals absent ; inner verticals especially weak, short, slender, and inconspicuous, almost hairlike, obviously much weaker than the preorbitals, the latter strong, bristlelike, nearly as well-developed as the orbitals, erect but curved mesad ; pseudovibrissae strong, followed on each side by 1 weak and 2 strong and well-spaced peristomal bristles, and 2 weak hairs ; postoccipital hairlike.

Mesonotum with one pair of long dorsocentrals ; presuturals weak and short, hairlike ; meso- and pteropleura bare ; postscutellum highly convex, narrower than scutellum. Mid tibial spur of moderate length, less than twice the diameter of the tibia.

Wing with second vein unusually long, ending just short of wing apex and narrowing the submarginal cell distally, the third costal sector only 0·80 times the length of the fourth sector ;

discal cell unusually long and broad, the hind crossvein twice the length of fore crossvein and situated beyond the middle of the wing ; ultimate sector of fifth vein only a short stub, distance from hind crossvein to wing margin 0·75 times the length of hind crossvein and 0·33 times the distance between the crossveins ; discal cell incompletely separated from second basal cell ; anal cell incomplete, anal vein short.

Length of body, 1·5 mm. ; of wing, 1·75 mm.

Distribution : India and Ceylon to Japan and Fiji.

East Nepal : Taplejung District : north of Sangu, about 5,000 ft., " dry grass above river bank," 3 ♂, 3 ♀, 5.i.1962 ; slope above Sangu, about 7,800 ft., " ex *Lycopodium* sp., " 1 ♂, 5 ♀, 11–14.i.1962 ; Sangu, about 6,200 ft., " mixed vegetation by stream in gully," 1 ♀, ix.–x.1961, and " mixed vegetation in deep gully," 1 ♂, 2.i.–13.ii.1962 ; below Sangu, about 4,000 ft., " mixed vegetation on sheltered slopes above river," 1 ♂, 3.i.1962 ; Dobhan, about 3,500 ft., " shady places on shrubby slope above River Tamur," 1 ♀, 21–27.i.1962. Arun Valley : below Tumlingtar, River Sabhaya, west shore, about 1,800 ft., " evergreen shrubs on sandy shore," 1 ♂, 1 ♀, 9–17.xii.1961 ; below Tumlingtar, east shore of River Arun, about 1,800 ft., " evergreen shrubs bordering dry stream beds," 1 ♀, 14–23.xii.1961 (all collected *R. L. Coe*) Brit. Mus. (Nat. Hist.). India : Assam : 6 mi. NW. Digboi, 1 ♂, 30–iii.1944 ; Kemi Nadi, 15 mi. NE. of Sadiya, 1 ♂, 24.ix.1943 ; Chabna, 2 ♀, 20.xii.1943 ; Duamara, NE. Doom Doom, 1 ♀, 2–xii.1943 ; Rupsi, 15 mi. NW. Dhubri, 1 ♀, 3.xi.1943 (all collected *D. E. Hardy*) U.S. Nat. Mus. Thailand : Phakhida Banlat, Chaivaphum, 1 ♂, 20.xii.1950 (*R. E. Elbel*) U.S. Nat. Mus. Malaya : Selangor, Kepong Forest Reserve, at light, 1 ♂, 1 ♀, iii–iv.1960 (*H. E. McClure*) ; Selangor, Ulu Gombak Forest Reserve, at light, 1 ♀, i–v.1960 (*H. E. McClure*) ; Selangor, Rantu Panjang, 5 mi. N. Klang, light trap, 1 ♀, ix–xii.1959 (*H. E. McClure*) ; Pahang, Kuantan, Swamp Forest on Pekan Road, at light, 1 ♀, x.1960 (*R. H. Wharton*) all U.S. Nat. Mus. Japan : Tokyo, 2 ♂, 6 ♀, 8.iv.1953 (*P. W. Oman*) ; Kyoto Prefecture, Kibune, 1 ♂, 3 ♀, 10.v.1953 (*P. W. Oman*) ; Shizuoko Prefecture, Gotemba, 1 ♂, 9.x.1952 (*P. W. Oman*) all U.S. Nat. Mus. ; Bonin Islands, Chichi Jima group, Ani Jima, Sen-zan (NE. bay), 1 ♀, 28.v.1958 (*F. M. Snyder*) Bishop Mus. Philippines : Luzon, Mt. Makiling, 2 ♀ (one the holotype) (*C. F. Baker*) ; Luzon, Manila, 1 ♂, 1 ♀ (*Robert Brown*) U.S. Nat. Mus. North Borneo : Tambunon, 7 ♀, 12.vii.1953 (*R. E. Elbel*), and " on grass around shaded seepage pools," 1 ♂, vii.1949 (*D. H. Colless*) U.S. Nat. Mus. Guam : Yigo, 1 ♀, x.1957 (*N. Krauss*) U.S. Nat. Mus. ; Machanao, " Pandanus," 1 ♂, 3 ♀, 4.vi.1936 (*O. H. Swezey*) Bishop Mus. Palau Islands : Koror Island, 2 ♂, 6.v.1953 and 17.vi.1953 (*J. W. Beardsley*) Bishop Mus. ; Koror Island, at light, 1 ♂, 30.vi.1953 and 2 ex., at light, 14.iv and 9.vi.1953 (*P. Adams*) Mus. Compar. Zool. ; Pelelieu Island, 1 ♀, 30.viii.1945 (*H. S. Dybas*) Chicago Nat. Hist. Mus. ; Babelthuap Island, Ulimang, 1 ♀, 10.xii.1947 (*H. S. Dybas*) U.S. Nat. Mus.; Koror Island, 8 ♂, 15 ♀, 2.v.1957, 2 ♂, 7 ♀, 29.iv.1957, and " sweeping grasses,', 1 ♂, 4 ♀, 3.v.1957 (*C. W. Sabrosky*) ; Malakal Island, 3 ♂, 7 ♀, 2.v.1957 (*C. W. Sabrosky*) U.S. Nat. Mus. and Bishop Mus.

This species, like the related *S. albibasis* sp. n., differs from other species of the genus by wing venation (second vein ending near apex of wing, and discal cell long and broad), absence of postverticals, weak inner verticals, and strong bristlelike preorbitals. Related but distinct species, mostly undescribed, also occur in the New World and in South Africa. The fundamental venation and pattern of *fascipennis* have been figured by Malloch (1927), Czerny (1929), and Collin (1951), with only slight differences that probably reflect variation, degree of maturity of the available specimens, or generalized drawing.

Available material indicates that *fascipennis* is an extremely common and wide-ranging species. I have seen no material from Ceylon and Fiji, the type localities of *Podocera ramifera* and *Diadelops distinctipennis*, except the types themselves which I examined only in a general way some years ago ; their descriptions show no appreciable differences from the abundant material before me. However, a small series from Natal, South Africa, with a wing identical to that of *fascipennis*, proved to have quite different ♂ genitalia, and it is possible that either the Ceylon or Fiji species or both may be found to be distinct on the basis of genitalic characters. However, in view of the known wide distribution of *fascipennis*, I believe that *ramifera* and *distinctipennis* are most probably synonyms.

### *Stenomicra albibasis* sp. n.

(Text-fig. 1)

Black, gray-pollinose species with predominantly yellow abdomen ; wings light brownish hyaline, basally white.

♀. Head and thorax black, bluish gray pollinose, dull ; antennae and proboscis yellowish to brown ; abdomen yellow, the first two terga and narrow lateral margins of three and four black ; legs yellow, distal segment of each tarsus black ; wing (Text-fig. 1) hyaline, light brown, white toward base, the veins yellow to light brown with conspicuously darker brown markings on first vein, toward base and at its apex, and on node at origin of third and fourth veins ; halteres white ; bristles of head and thorax black.

Front 1·25 times the width of an eye ; ocellar triangle midway between vertex and anterior margin of front ; in profile, eye slightly more diagonal than usual, revealing broader area of lower occiput ; postverticals absent, inner verticals short and weak, preorbitals moderately long and strong, though still obviously much less developed than the orbital bristles ; 2 strong and 3 short and hairlike peristomal bristles, in addition to the pseudovibrissae. Mesonotum with one pair of strong dorsocentral bristles ; presuturals weak and short, hairlike ; meso- and pteropleura bare. Fore femur with 2 long, outstanding posteroventral bristles on distal third.

Wing as figured (Text-fig. 1) ; the second vein very long, curving parallel to costa and ending slightly before apex of wing ; discal cell broadened distally, the hind crossvein 2·2 times the length of fore crossvein ; ultimate sector of fifth vein 0·60 times the length of penultimate sector of fourth vein (distance between crossveins), the distance from hind crossvein to margin of wing subequal to the penultimate sector of fourth vein.

Lengths of body and of wing, 1·75 mm.

Holotype ♀. JAPAN : Kyoto Prefecture, Kibune, 10.v.1953 (*P. W. Oman*) U.S. Nat. Mus., Type No. 67514.

In fundamental characters, as noted in the first couplet of the key, this species resembles *S. fascipennis* Malloch, but is easily distinguished by the absence of the conspicuous white bands over the crossveins.

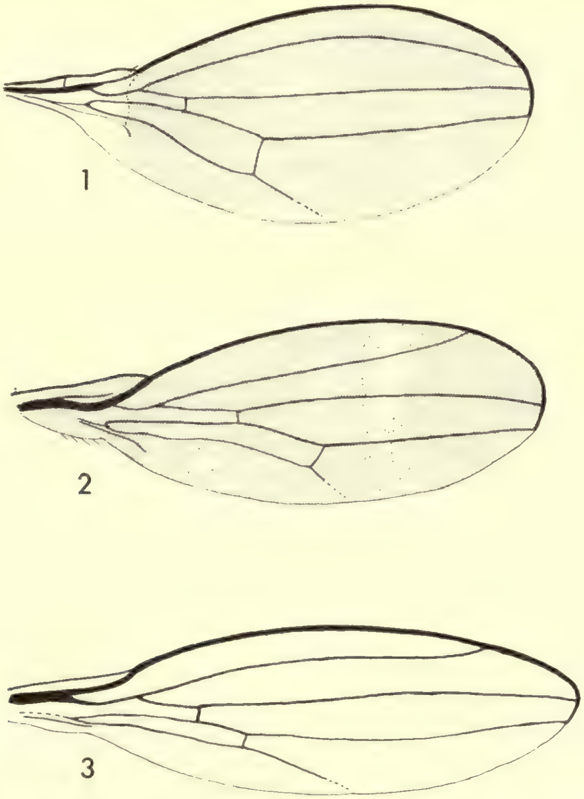
## *Stenomicra argentata* sp. n.

(Text-fig. 2)

Shining yellow species, the wings light brownish hyaline marked with white crossband and anal spot.

♀. Almost entirely yellow ; face, antennae, mesonotum, and scutellum deep yellow, almost orange ; small ocellar tubercle black ; cheeks and mesopleura brown in ground color, overlaid with silver pollinosity ; abdomen yellow with triangular brown spot on middle of third tergum ; legs yellow except for narrow black base of hind tibia ; wing lightly browned, faintly grayish white apically, narrow white crossband at outer two-thirds and a white spot in anal area (Text-fig. 2), the anal spot chiefly and 3 spots in the crossband glistening white at certain angles, because of dense patches of silvery microtrichia ; halteres white ; bristles chiefly brown.

Front polished, at the vertex slightly wider than an eye and slightly over one-third the head width ; eye with facets larger above than below ; face flat, smooth, highly polished, without trace of median carina, ending broadly in a sharp rim above the pseudovibrissae ; epistomal and peristomal areas below and behind the pseudovibrissae also smooth and polished ; cheeks subshining with the brilliant silver pollinosity ; arista with six long rays dorsally toward base ; postverticals present but barely discernible, short, weak, appressed, and slightly converging ; inner verticals short and weak, though distinct ; preorbitals very short and weak ; pseudo-



FIGS. 1–3. 1, wing of *Stenomicra albibasis* ; 2, wing of *S. argentata* ; 3, wing of *S. angustiforceps*.

vibrissae strong, with a pair of weak, erect bristles immediately below them, followed by strong peristomal bristles (3 strong, 1 weak on right side, 4 strong, 1 weak on left, in the lone available example).

Thorax highly polished except for silvery pollinose mesopleura ; presutural bristle long and strong, equal to anterior notopleural ; each mesopleuron with 2 short but distinct bristles and a weak hair or two along posterior margin.

Fore femur with strong, straight posteroventral bristle at outer two-thirds of femur, and distally from that 3 shorter, curved, preapical posteroventral bristles.

Wing as figured (Text-fig. 2) ; second vein ending well before apex of wing, the third costal sector 4 times length of fourth sector ; discal cell weakly broadened distally, the hind crossvein slightly oblique and twice the length of fore crossvein ; ultimate sector of fifth vein a short stub, only 0·20 to 0·25 times the length of penultimate sector of fourth vein (distance between crossveins), the distance from hind crossvein to margin of wing 0·55 times the length of penultimate sector of fourth vein ; anal vein distinct but short ; alula present but narrow, with a few short fringe hairs.

Lengths of body and of wing, 1·75 mm.

Holotype ♀. MALAYA : Selangor, Kepong Forest Reserve, at light, iii–iv.1960 (*H. E. McClure*) U.S. Nat. Mus., Type No. 67515.

The distinctive wing pattern will readily separate this species from known congeners.

The species falls in the typical section of the genus, with second vein ending well before the apex of the wing, but in several respects it is intermediate between the two groups. The discal cell is long and slightly broadened, the hind crossvein is approximately twice the length of the fore crossvein, and the ultimate sector of the fifth vein is relatively short, compared with the short, parallel-sided discal cell, subequal crossveins, and long ultimate sector of fifth vein in the species of the typical group. Furthermore, the inner vertical bristles are weak and short, as in the species of the *fascipennis* group, whereas they are moderately strong in typical *Stenomicra*.

### ***Stenomicra angustiforceps* sp. n.**

(Text-figs. 3, 5)

Pale species with slender, hyaline wing, the males with slender elongate forceps (surstyli).

♂♀. Pale, predominantly yellow, only weakly shining. Head whitish yellow, except for black ocellar tubercle and aristae, and orange-yellow antennae and proboscis. Thorax yellow, darker above, the sides of the mesonotum infuscated outside the dorsocentral lines, slightly bluish gray, appearing as two dark stripes ; scutellum chiefly concolorous with the dark mesonotal stripes, apically yellowish ; postscutellum and metanotum dark brown. Abdomen chiefly yellow, including genital segments of both sexes ; second through fourth terga in both sexes each with broad brown subapical band, most distinct on the fourth tergum, and a band across dorsum of seventh tergum in ♀ and on first genital segment of ♂. Legs pale yellow, the distal segment of each tarsus brown to blackish. Wing hyaline, faintly yellowish. Halteres whitish yellow. Bristles and hairs pale, yellowish, except for black peristomal bristles.

Front at vertex 1·7 times the width of an eye ; eye strongly oblique in profile, twice as long as broad, with enlarged facets above and slightly enlarged below ; postverticals present, short and hairlike, divergent ; inner vertical bristles well developed, moderately strong ; preorbitals short ; pseudovibrissae strong, followed on each side by 1 weak, 4 strong, and 1 moderately strong peristomal bristles, plus a bristle on postocciput.

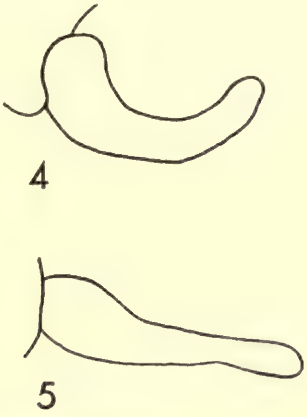
Mesonotum with 2 pairs of strong dorsocentral bristles, the dorsocentral hairs gradually increasing in length posteriorly ; presutural bristle well developed, nearly as long as the anterior notopleural ; pteropleura bare, the mesopleura presumably so but partly obscured by pin in the available specimens.

Legs : Mid tibial spur of moderate length, no more than twice the diameter of the tibia.

Wing as figured (Text-fig. 3), long and narrow, almost lanceolate toward apex ; second costal sector long, but ending well before apex of wing, the third costal sector 5 times the length of fourth sector ; crossveins only moderately separated, the distance between them (penultimate sector of fourth vein) slightly shorter than penultimate sector of third vein and slightly over 0·40 times the distance from hind crossvein to margin of wing ; discal cell small ; anal cell absent and anal vein undeveloped.

♂ genitalia as in Text-fig. 5, the forceps (surstyli) slender and elongate.

Length of body, 1·5–1·75 mm. ; of wing, 2 mm.



FIGS. 4–5. 4, left surstylus of *S. fascipennis* ; 5, left surstylus of *S. angustiforceps*.

Holotype ♂, allotype ♀, and paratypes ♂, 2 ♀, EAST NEPAL : Taplejung District, north of Sangu, about 5,000 ft., " dry grass above river bank," 5.i.1962 (*R. L. Coe*) Brit. Mus. (Nat. Hist.).

I have also seen a headless and crushed female, not included in the type series, from the same district of East Nepal, below Sangu, about 4,000 ft., " mixed vegetation on sheltered slope above river," 3.i.1962 (*R. L. Coe*).

*Stenomicra angustiforceps* belongs to the typical section *Stenomicra*, with its small and parallel-sided discal cell. The hyaline-winged species in this group are best distinguished by the ♂ genitalia. This species is particularly well marked by its slender and elongate forceps.

## ***STENOMICRA*** spp.

In material from Southeast Asia are some pale individuals that resemble and will key to *S. angustiforceps*. Possibly they belong to distinct species, but present material is inadequate for decision. Micronesian collections contain two pale species that differ from *augustiforceps* only in the characters of the ♂ genitalia, and it appears that there is a complex of closely related forms which will be difficult to distinguish.

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# DIPTERA FROM NEPAL

# PSYCHODIDAE

*By* F. VAILLANT

SYNOPSIS

This collection contained twenty-four specimens, representing four known genera, five new species and one new subspecies.

UP to this date, only two species of Diptera of the family Psychodidae have been recorded from India, *Horaiella prodigiosa* Tonnoir (subfamily Trichomyinae) and *Telmatoscopus* (*Neotelmatoscopus*) *horai* Tonnoir (subfamily Psychodinae) but, in the collections of the British Museum Nat. Hist.), I examined a male specimen labelled *Pericoma metatarsalis* Brun. var *khasiensis* Senior White, India, Khasia Hills, Mawphlang, 10.x.1920.

Mr. R. L. Coe, of the British Museum, collected in 1961 and 1962, several Psychodid flies in Nepal, in the Taplejung district. One was caught below Tamrang Bridge, at an elevation of 5,500 ft., all the others were from Sangu, at 6,200 ft. They all belong to the subfamily Psychodinae, and I wish to express my thanks to Mr. Coe for the opportunity to study them. The flies were pinned, but I had to boil them in caustic potash and mount them on slides, after noting the colour of their vestiture. The types (on slides) are now in the British Museum (Nat. Hist.).

## *Trichopsychoda atra* sp. n.

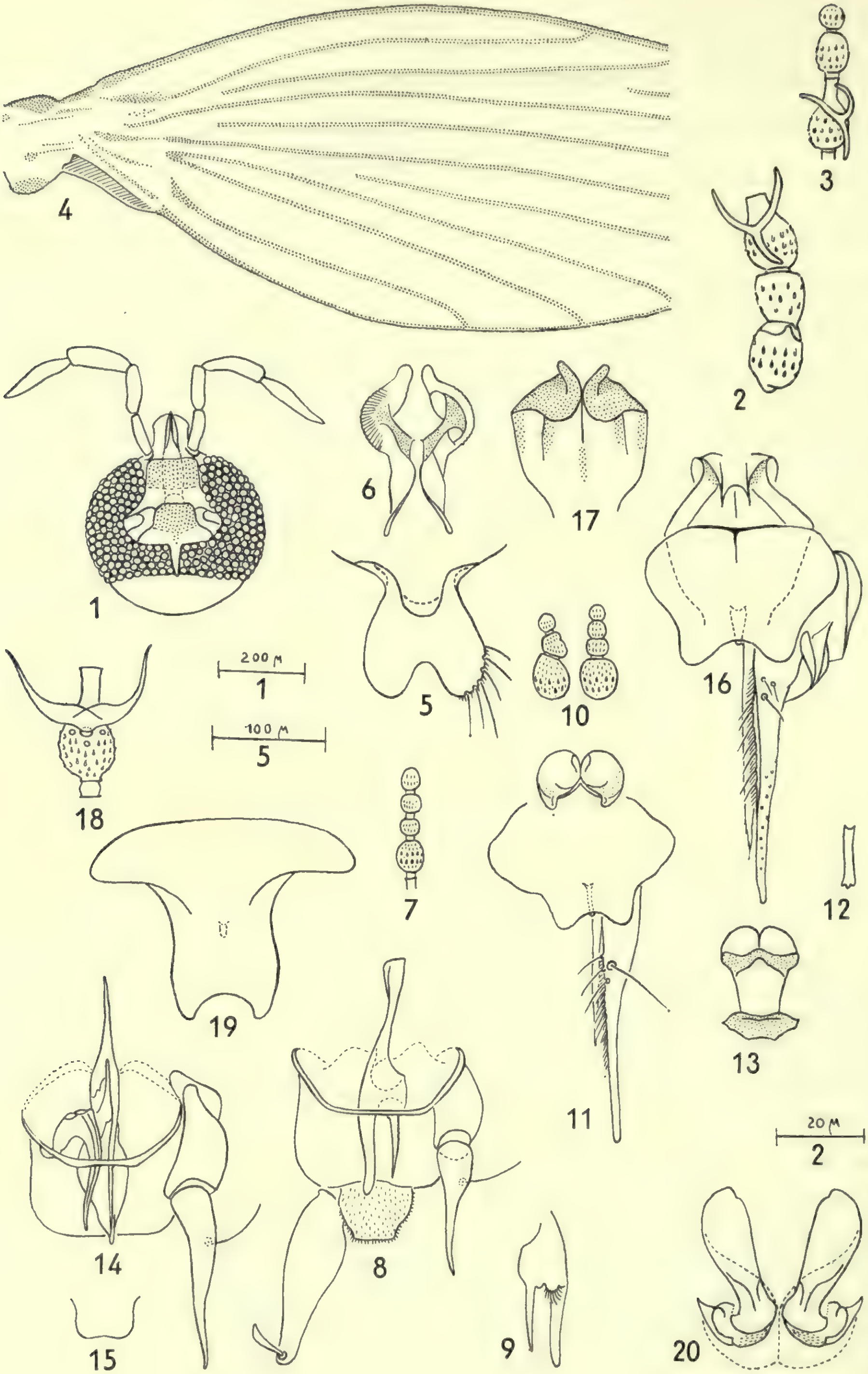
(Text-figs. 1–6)

♀. On the whole body, the hairs are dark brown or black. The eyes touch each other at their posterior internal angles. The antennae have only 14 segments and their ratio is : 20. 15. 21. 23. 24. 24. 24. 24. 24. 24. 24. 20. 14. 7. Each segment from 3 to 13 has a pair of Y-shaped ascoids. Ratio of segments of palpus : 29. 32. 43. 50. The wing has dark brown hairs on its proximal part, up to the level of fork $M_1+M_2$ ; on its distal part, the wing has a golden covering ; the fringe is also golden in the distal part of the wing, but brown at its tip ; a few stout dorsal bristles just posterior to the costal vein ; subcostal vein very short ; the wing is as acute as it is in *Tr. africana* Quate and the nerve $R_5$ ends exactly at the apex. The subgenital plate is crescent shaped and has long hairs on its posterior margin.

Wing length 2·0 mm.

Holotype ♀. Sangu, at light on camp site, 3.x.1961.

All species of *Trichopsychoda* described up to this date have 15- or 16-segmented antennae, and the terminal two or three segments are subspherical. Thus *Tr. atra*, in having 14-segmented antennae, is different from the other species, and the definition of the genus *Trichopsychoda*, as given by L. W. Quate, does not apply to it entirely. The end of one of the antennae of the only specimen examined is missing


200 µ
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and it is possible that one or two segments were detached from the other antenna ; a close examination seems to show that this is not true.

By its wing venation, *Tr. atra* n. sp. is closely related to *Tr. africana* Quate, from South Africa.

### ***Psychoda cinerea indica*** **ssp. n.**

(Text-figs. 7–13)

♂. Head with dark brown vestiture ; ratio of segments of antennae : 27. 17. 27. 27. 30. 31. 31. 31. 30. 30. 26. 26. 11. 6. 6. 6. Ratio of segments of palpi : 23. 28. 35. 43. Thorax with dark brown vestiture ; a wide light brown tuft of hairs between the wings. Covering light brown on legs, from their base to the 3/4 of the first joint of the tarsi ; covering dark brown on the distal part of the tarsi. Wings 0·40 times as wide as long, with light brown hairs. Halteres black on their stem and the base of their knob, light brown on the larger part of their knob.

Wing length 1·3 mm.

Holotype ♂. Sangu, swarming at dusk in bushy gully, 23.xi.1961, 9.i.1962.

*Ps. cinerea indica* differs from *Ps. cinerea cinerea* Banks from Europe (Text-figs. 14–15) by the proportions of the wing and by the shape of the aedeagus. The wing of *Ps. cinerea cinerea* is 0·34 times as wide as long.

♀. A specimen, captured also at Sangu, is probably of the same subspecies ; though its colour is different from that of the ♂, the shape of the wings is the same, and the ratio of the antennal segments is not very different.

Head with light brown vestiture. The left antenna is abnormal, for its 14th and 15th segments are partly fused ; ratio of segments of right antenna : 27. 17. 27. 28. 28. 28. 28. 28. 28. 28. 26. 23. 13. 5. 5. 5. Ratio of segments of palpi : 21. 26. 26. 35. Thorax with a parting on the medio dorsal line, ochraceous, but with a large reddish brown patch on each shoulder. Wing 0·40 times as wide as long, with ochraceous covering. Each cercus has a long ventral seta.

Wing length 1·7 mm.

1 ♀, Sangu, at light on camp site, 3.x.1961.

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FIGS. 1–20. *Trichopsychoda* and *Psychoda* spp. 1–6. *Tr. atra* sp. n., ♀. 1, head, dorsal side ; 2, first three segments of antenna ; 3, tip of antenna; 4, proximal part of wing ; 5, subgenital plate ; 6, armature of genital accessory vesicles, ventral view on left, more dorsal view on right. 7–9. *Ps. cinerea indica* ssp. n., ♂. 7, tip of antenna ; 8, genitalia, dorsal view ; 9, distal part of aedeagus, ventral view. 10–13. *Ps. cinerea indica* ssp. n., ♀. 10, tips of both antennae ; 11, subgenital plate, left half of ovipositor and armature of genital accessory vesicles, ventral view ; 12, dorsal lobe of subgenital plate, enlarged. 13, armature of genital accessory vesicles, dorsal view. 14–15. *Ps. cinerea cinerea* Banks, ♂. 14, genitalia, dorsal view; 15, plate that is between the IXth sternite of the abdomen and the aedeagus. 16–17. *Ps. cinerea cinerea* Banks, ♀. 16, subgenital plate, left half of ovipositor and armature of accessory vesicles, ventral view ; 17, armature of genital accessory vesicles, dorsal view. 18–20. *Ps. magna* sp. n., ♀. 18, 6th segment of antenna ; 19, subgenital plate, ventral view ; 20, armature of genital accessory vesicles, dorsal view.

Figs. 1 and 4 to the same scale ; figs. 5–11, 13–17 and 19 to the same scale ; figs. 2, 3, 12, and 18 to the same scale.

The wings of ♀ specimens of *Ps. cinerea cinerea* from Europe (Text-figs. 16, 17) are 0·36 times as wide as long, and their subgenital plate is quite different from that of *Ps. cinerea indica.*

### ***Psychoda magna*** **sp. n.**

(Text-figs. 18–20)

♀. The only specimen available has lost much of its covering and the distal part of both antennae. Eyes separated by distance equal to about 1 facet and a half. Ratio of the first seven antennal segments : 27. 20. 32. 34. 34. 35. 35 ; a pair of flat and bifurcate ascoids on each segment from 3 to 7. Ratio of the segments of the palpi : 26. 26. 28. 43. Wing venation almost similar to that of *Ps. cinerea*; the medial fork is at the same distance from the apex of the wing as from the hollow at the tip of the anal vein. The wing is acute and the nerve $R_5$ ends at the apex ; the costal cell has a brownish tinge. Subgenital plate of conspicuous shape. Cerci rather short.

Wing length : 3·2 mm.

Holotype ♀. Sangu, spray-splashed rocks in shallow ravine, 13.i.1962.

*Ps. magna* differs from all other species of the same genus in the shape of its subgenital plate, the posterior part of which has parallel sides and a very small dorsal process far from the hind margin.

### ***Telmatoscopus (Telmatoscopus) arcuatus*** **sp. n.**

(Text-figs. 21–31)

♂. Vestiture of the whole body tawny. Eyes broadly contiguous ; bridge with 3 or 4 rows of facets. Ratio of segments of antennae : 47. 17. 27. 28. 28. 28. 28. 28. 28. 28. 28. 21. 20. 17. 17. 22 ; each segment from 3 to 9 has a complete transversal row of circular spots, where the cuticula is thin, but does not seem to bear ascoids ; on each of the last 7 segments, the spots are not regularly disposed. Ratio of segments of palpi : 20. 41. 41. 48. The wing is rounded at its apex, and the vein $R_4$ ends anteriorly, but very close, to the wing apex. Dististyles bent at their distal 2/3 and with a short branch on their inner side. Each cercopod with 10 or 11 spatulate tenacula.

Wing length : 2·2 mm.

Holotype ♂. Below Tamrang Bridge, river bank, x–xi.1961.

*T. arcuatus* differs from most species of the subgenus *Telmatoscopus* with contiguous eyes and broad wings in its long curved forceps and bifurcate dististyles ;

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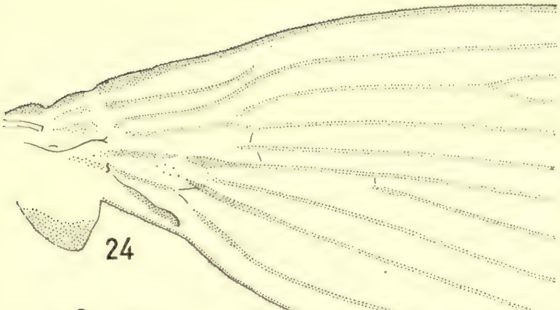
FIGS. 21–41. *Telmatoscopus* spp. 21–31. *T. arcuatus* sp. n., ♂. 21, base of antenna ; 22, 9th segment of antenna ; 23, tip of antenna ; 24, proximal part of wing ; 25, genitalia, side view ; 26, right cercopod, side view ; 27, tenaculum of cercopod, enlarged ; 28, left forceps, dorsal view ; 29, subgenital valvula and plate that is between the IXth sternite of the abdomen and the aedeagus, dorsal view ; 30, anal valvula ; 31, aedeagus, dorsal view. 32–40. *T. nepalensis* sp. n., ♂. 32, head, dorsal side; 33, base of antenna; 34, tip of antenna ; 35, proximal part of wing; 36, right cercopod, side view; 37, tip of tenaculum, enlarged. 38, left forceps, dorsal view ; 39, subgenital valvula ; 40, aedeagus ; 41. *T. nepalensis* sp. n., ♀, 9th segment of antenna, side view.

Figs. 24, 32, and 35 to the same scale ; figs. 26, 28, 29–31, 36, and 38–40 to the same scale ; figs. 21–23, 27, 33, 34, 37 and 41 to the same scale.



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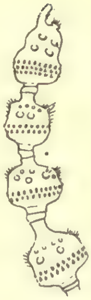

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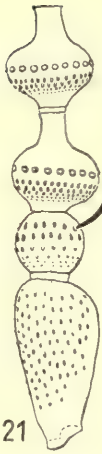

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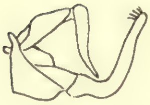

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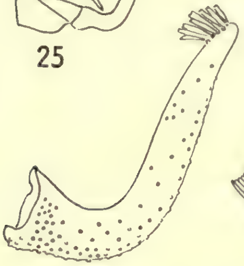

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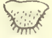

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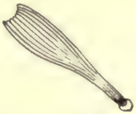

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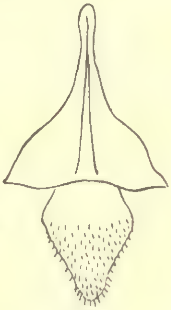

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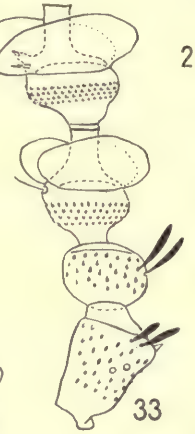

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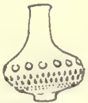

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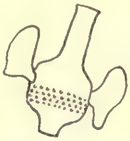

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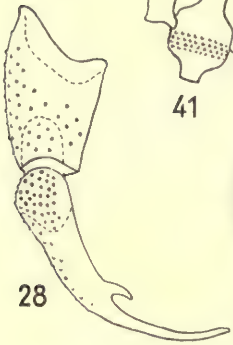

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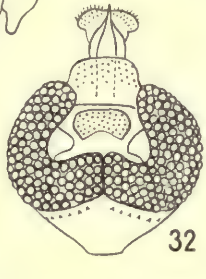

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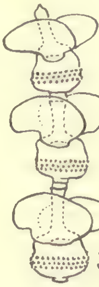

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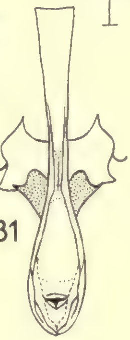

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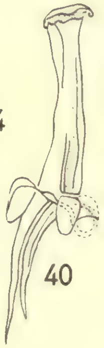

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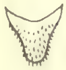

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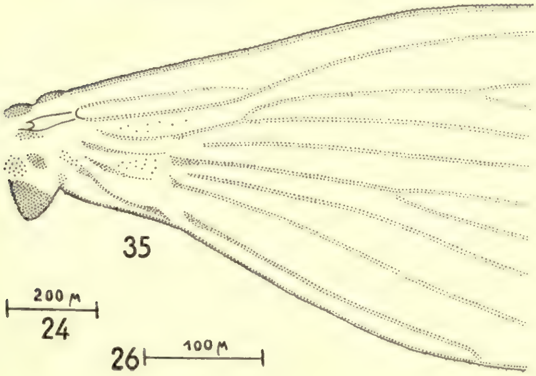

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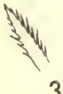

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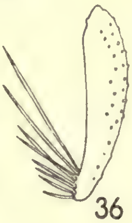

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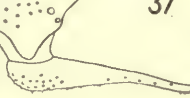


38

200 µ
24

26 100 µ

it differs from *T. praecipius* Quate and *T. maai* Quate from Borneo, which also have contiguous eyes and broad wings, in the proportions of the wings; these are about 1·3 times as long as wide for these last two species, and about 3 times as long as wide for *T. arcuatus* sp. n.

### *Telmatoscopus (Mormia) nepalensis* sp. n.

(Text-figs. 32–42)

♂. A tuft of dark brown hairs on the forehead; the rest of the head with tawny vestiture. Eyes contiguous on midline; eye bridge with 4 rows of facets. Antennal ratio of segments: 34. 16. 32. 33. 30. 30. 30. 30. 30. 30. 29. 29. 29. 26. 24. 24; a pair of wide flat leaf-shaped ascoids on each segment 3 to 16; segments 4 and 5 have in addition a short spine; the neck of the segments 3 to 9 is eccentric. Ratio of segments of palpi: 23. 40. 40. 70. Thorax with light brown vestiture; a dark brown tuft between the wings; a strip of light yellow hairs on the median line and some hairs of the same colour on each side of the thorax. Light brown and light yellow hairs all over the legs. Nerves of the wing and posterior fringe with light yellow hairs; anterior fringe light brown. Tip of wing rounded, between the apex of $R_4$ and that of $R_5$; the subcostal vein ends in the costal vein. Eight ramose tenacula on each cercopod. Aedeagus dissymetrical.

Wing length: 2·2 mm.

♀ (Text-figs. 41–42). Same vestiture as ♂. Eyes similar to those of ♂. Antennal ratio: 27. 16. 25. 23. 23. 23. 22. 22. 22. 21. 20. 19. 19. 19. 17. 18; ascoids much smaller than they are for the male. Ratio of palpus: 21. 38. 36. 57.

Wing length: 2·2 mm.

Holotype ♂. Sangu, spray splashed rocks in shallow ravine, 13.i.1962.

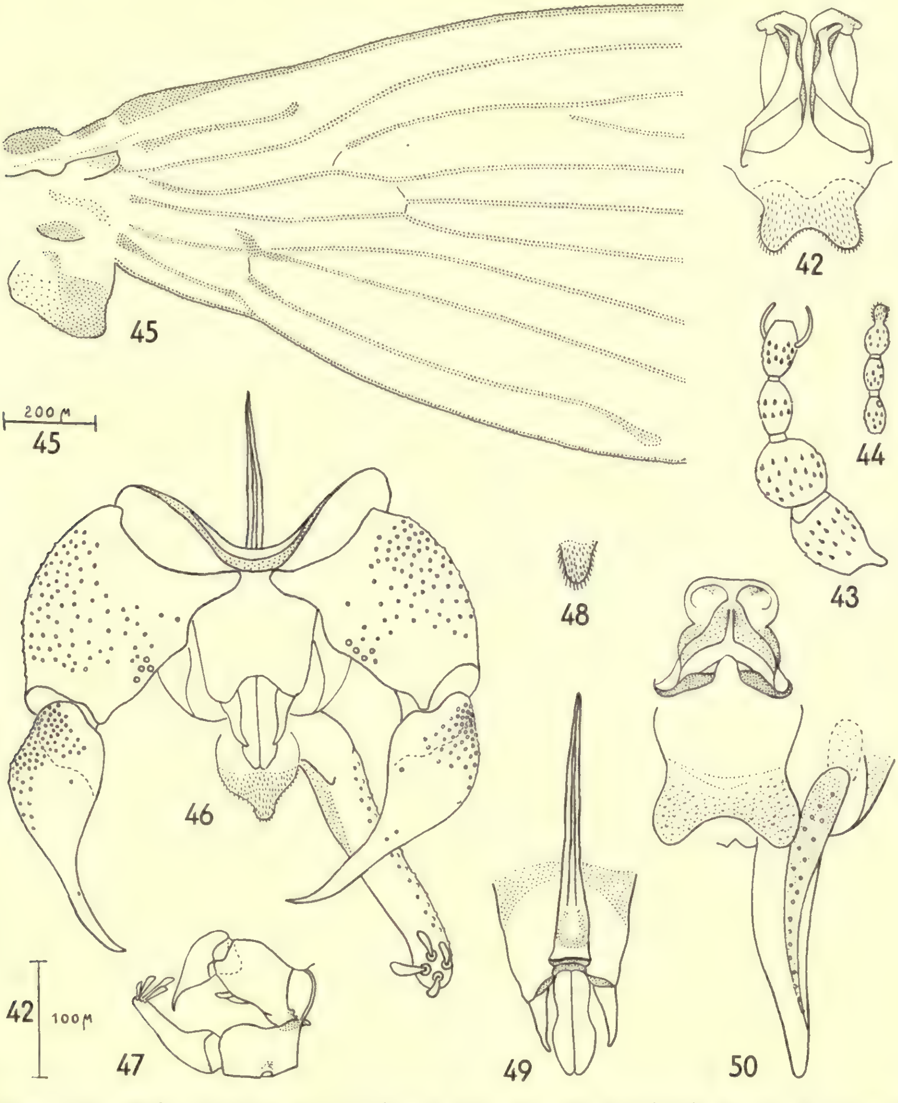
Paratype ♀: same data as holotype ♂.

*T. nepalensis* can be considered as a *Mormia*, because the origin of the stem of the anterior fork is past the apex of the basal cell. It differs from the other species of *Mormia* in having no port-hole organs; besides the necks of some flagellar segments are longer than the basal bulbs. *T. nepalensis* has contiguous eyes, and very few species of *Mormia* share this character.

### *Pericoma coei* sp. n.

(Text-figs. 43–50)

♂. Light yellow vestiture on all the head and body. Eyes separated by distance equal to almost 2 facets. Antennal ratio: 24. 17. 16. 16. 16. 16. 16. 15. 15. 15. 15. 15. 14. 11. 11. 13; 2 ascoids of equal length on segments 4 to 11, 2 ascoids of unequal length on segment 12, only one ascoid on segment 13, and no ascoid on segments 1, 2, 3, 14, 15 and 16; ascoids simple, rod-like. Ratio of palpus: 27. 33. 48. 75. Body with light yellow vestiture. Legs I and II: femur and tibia with light grey hairs and a few brown ones; nevertheless, the apex of the tibia has a white covering; first segment of the tarsus black on its proximal 1/3, white on its distal part; 4 other segments of the tarsus with black vestiture. Legs III: same covering; but there are only a few white hairs at the apex of the tibia, and a few black ones at the base of the first segment of the tarsus. Wing with tawny covering, but with several patches of hairs of another colour; one large white patch at the apex of the first basal cell, a smaller one on the medial fork and an oblique transverse patch between the two other ones; a patch of black hairs on the 1/3 of nerve $R_1$, another one on the median fork and one at the tip of each of the nerves $R_5$, $M_1$, $M_2$, $M_3$ and $Cu$; the fringe is grey on the proximal part of the wing, black on the anterior edge, white at the apex, and tawny on the posterior edge ; the medial fork is before the level of the tip of *Cu* and the radial fork is distal to it. Apex of the wing closer to tip of $R_5$ than to tip of $R_4$. Halteres with light yellow scales on rod and dark ones on knob. Each cercopod with 4 tenacula ; dorsal plate of the genitalia with two pointed lobes.



FIGS. 42–50. *Telmatoscopus* and *Pericoma* spp. 42. *T. nepalensis* sp. n., ♀, subgenital plate and armature of genital accessory vesicles, ventral view. 43–49. *P. coei* sp. n., ♂. 43, base of antenna ; 44, tip of antenna ; 45, proximal part of wing ; 46, genitalia, dorsal view ; 47, genitalia, side view ; 48, anal valvula ; 49, aedeagus, ventral view. 50. *P. coei* sp. n., ♀, subgenital plate, left half of ovipositor, and armature of genital accessory vesicles, ventral view.

Figs. 42–44, 46, 48–50 to the same scale.

Wing length : 2·5–2·6 mm.

♀ (Text-fig. 50). Same colour as ♂. Segments 4 to 13 of the antennae with ascoids of equal length ; segments 1, 2, 3, 14, 15 and 16 without ascoids ; ratio : 12. 20. 13. 17. 17. 16. 15. 15. 15. 15. 15. 15. 15. 12. 11. 12. Ratio of segments of palpi : 27. 35. 48. 77.

Wing length : 2·5 mm.

Holotype ♂. Sangu, rotting fruits of Bhor tree on ground, 7–31.x.1961.

Paratypes: 1 ♂, 1 ♀, same data as holotype ; 3 ♂, Sangu, mixed vegetation by stream in gully, xi.1961.

*P. coei* sp. n. is closely allied to several European species, especially to *P. palustris* (Meigen), to *P. trivialis* Eaton, and to *Pericoma* of the *unispinosa* group. It differs from the first two species in having two pointed lobes on the dorsal genital plate of the male ; it differs from the *Pericoma* of the *unispinosa* group in having 4 tenacula of equal size on each cercopod of the male.

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# DIPTERA FROM NEPAL

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# CELYPHIDAE

*By* P. VANSCHUYTBROECK

## SYNOPSIS

Aucun Celyphide, à ma connaissance, n'est connu du Népal. Des quatre exemplaires récoltés, un appartient à une espèce très répandue en Asie : *Celyphus obtectus* Dalman ; deux espèces sont nouvelles : *Spaniocelyphus nepalensis* et *Celyphus coei*.

ESSENTIELLEMENT tropicaux, les Celyphides appartiennent, principalement, à la faune oriental, par six genres sur huit décrits ; ce sont : *Hemiglobus* Frey, *Spaniocelyphus* Hendel, *Celyphus* Dalman, *Acelyphus* Malloch, *Paracelyphus* Bigot et *Idiocelyphus* Malloch.

## ***CELYPHUS*** Dalman

*Celyphus* Dalman, 1823, *Analecta Entomologica* : 32, pl. II, B, fig. 1 à 5.

Nervure transverse bien nette séparant la cellule discale et la cellule basale antérieure de l'aile. Arista fortement écartée de la ligne médiane à la base, de plus de la moitié de sa base, en forme de feuille, la plus large section presque ou tout à fait aussi large que le troisième segment antennaire. Scutellum hémisphérique ; occiput arrondi, soies postverticales manquantes ou réduites. Arista foliacée.

### ***Celyphus obtectus*** Dalman

*Celyphus obtectus* Dalman, 1823, *Analecta Entomologica* : 32–33.

Généralement petite espèce avec pattes non entièrement noires. Pas de tache noire à la partie inférieure de la face. Deux soies postverticales. Partie filiforme apicale de l'arista toujours visiblement plus courte que la partie élargie. Scutellum habituellement bleu métallique, plus ou moins rugueux jusqu'à l'apex, avec une ligne médiane plus ou moins lisse.

Arun Valley, east shore of R. Arun below Tumlingtar, *c*. 1800′, 14–23.xii.1961, evergreen shrubs bordering dry stream-bed, 1 ♂ (*R. L. Coe*).

### ***Celyphus coei*** **sp. n.**

(Text-figs. 1–2)

Espèce voisine des *C. lucidus* Karsh et *C. ceylanensis* Vanschuytbroeck. Teinte foncière jaune brun et violacée ; scutellum granuleux, élargi antérieurement. Thorax avec plaques humérales triangulaires et épaules proéminentes brun rouge, brillantes. Pleures uniformément jaunâtres. Transverses alaires peu marquées entre seconde cellule basale et discale.

Bull. Brit. Mus. (Nat. Hist.), Entom., **17** (5), 1965.

Face et front testacés, brillants ; bords de la face avec plaque plus foncée, à reflets violacés, couvertes de soies noires ; prélabrum brun brillant ; palpes allongés, jaune brun avec moitié apicale noire. Front de teinte uniforme. Segments basal et médian de l'antenne jaune clair, le segment apical plus foncé, bordé de noir ; arista lancéolée, plus longue que les trois segments antennaires réunis, jaunâtre, noircie le long des bords et à la base, couverte d'une courte pilosité noire, l'extrémité sous forme d'un soie plumeuse, de moitié de la longueur de la partie foliacé de l'antenne. Tubercule ocellaire bleu noir, brillant.

Mesonotum jaune brun, mat brillant, sans tache ou bande plus foncée ; calus huméral proéminent, portant une fine pilosité courte. Scutellum globuleux ovoïde, très légèrement allongé longitudinalement avec extrémité apicale arrondie, plus long que large (5.2 à 3).

Pattes généralement jaunâtres ; extrémités apicales des fémurs et extrémités basales des tibias postérieurs légèrement rembrunis ; fémurs antérieurs portant deux rangées parallèles de quatre soies courbées ; tibias antérieurs avec une soie vers le 1/3 apical en plus de l'épine apicale postérieure ; tibias antérieurs des 2/3 des fémurs.

Ailes hyalines sauf à l'apex aum ême niveau des 2-eme et 3-eme nervures longitudinales depuis les 2/3 de la base ; nervures longitudinales trois et quatre non parallèles ; section médiane de la quatrième nervure longitudinale (ta-tp) dans le rapport de 7 à 8 ; sous costale s'étendant jusqu'à la moitié de la costale ; $R_1$ recourbée à l'apex vers la costale (10) et écartée de *M* de la moitié de cette distance de la sous costale (5).

Abdomen élargi transversalement, sternites bordés de brun ; dernier sternite portant une plaque médiane brune.

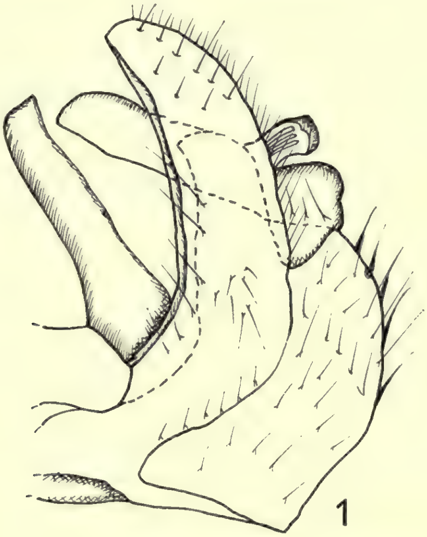


FIG. 1. *Celyphus coei* sp. n. ♂ Hypopyge.

Holotype ♂. Taplejung Distr., Dobhan, *c.* 3,500′ ; small pockets of plants on arid slopes above R. Maewa, 2.i.1962 (*R. L. Coe*). (British Museum (Nat. Hist.)).

Paratype ♂ : ibidem.

## *SPANIOCELYPHUS* Hendel

*Spaniocelyphus* Hendel, 1914, *Suppl. Ent. Berl.* **3** : 92.

Vertex à bords aigus, sans soies postverticales bien développées. Cellule discale et cellule basale postérieure de l'aile séparées par une nervure transverse bien distincte. Palpes bien moins élargis à l'apex que dans le genre *Acelyphus*. Front plus court également que chez *Celyphus*. Abdomen étroit, avec bandes latérales bien marquées. Premier article des antennes plus court que le troisième. Scutellum ovale, plus long que large, un peu plus large que le thorax ; arista élargie en forme de feuille. Pas de soies scutellaires. Fémurs postérieurs sans forte épine apicale courbée, mais portant une petite soie apicale.

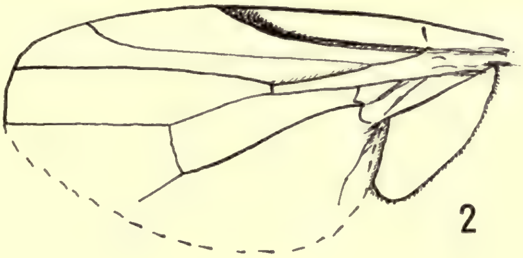
## *Spaniocelyphus nepalensis* sp. n.

(Text-fig. 3)

De teinte générale métallique, bleu vert à reflets violacés ; tête jaune brun avec plaques violacées ; abdomen entièrement bleu ; pattes jaunâtres, plus ou moins rembrunies ; soies antennaires aplaties, élargies, lancéolées avec apex garni d'une soie plumeuse ; scutellum rugeux ; mésonotum avec seulement bande médiane longitudinale rugeuse ; pleures unicolores ; soies verticales externes, courtes, dirigées vers l'extérieur ; seconde cellule basale séparée de la cellule discale par une transverse complète.

Face et front testacés, brillant, chaque côté du front avec une bande plus claire, le long du rebord des yeux ; front brunâtre avec reflets violacées ; rebord buccal bleuté ; segments basal et médian des antennes brunâtres, le basal cependant plus fortement rembruni ; segment apical plus pâle et plus large, avec une encoche médiane noire sur le bord supérieur pour l'insertion de l'arista; soie antennaire lancéolée, plus longue que la soie plumeuse apicale (16 à 8). Tubercule ocellaire noirâtre ; occiput jaune brun avec aires latérales plus foncées.

Mesonotum avec une aire longitudinale médiane rugeuse, les parties latérales lisses, entièrement brillant, bleuté à reflets violacés ; humerus fortement proéminent transversalement ; pleures bleu violacé, brillant. Scutellum entièrement rugeux, brillant, ovale, une fois et demi plus long que large (45 à 30) ; arrondi apicalement, mais plus aigu à l'apex, recouvrant entièrement l'abdomen.



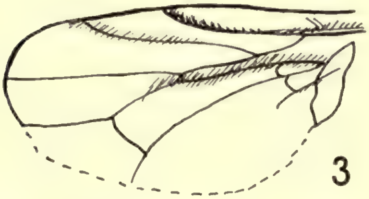


FIG. 2. *Celyphus coei* sp. n. ♂ Aile.
FIG. 3. *Spaniocelyphus nepalensis* sp. n. ♂ Aile.

Hanches antérieures brunes ; médianes et postérieures noirâtres ; pattes antérieures manquent ; pattes médianes et postérieures largement noircies ; tarses jaune brun.

Ailes avec cellules basale et discale séparées par une nervure transverse complète.

Holotype ♂. Taplejung Distr., between Sangu and Tamrang, x–xi.1961, mixed shrubs in deep gorge, *c.* 5,200′ (*R. L. Coe*). (British Museum (Nat. Hist.)).

*S. nepalensis* est voisin du *S. scutatus* Wiedemann, dont il diffère essentiellement par la forme du scutellum (plus allongé du *nepalensis*) ; la présence seulement d'une ligne médiane rugueuse au scutellum chez *scutatus* ; la soie antennaire lancéolée chez les deux espèces, mais soie terminale plumeuse bien plus longue chez *nepalensis*.

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BULLETIN OF
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BY

R. G. FENNAH

Commonwealth Institute of Entomology

*Pp.* 231–272 ; 199 *Text-figures*

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# FULGOROIDEA FROM SOUTHERN CHILE (HEMIPTERA)

*By* R. G. FENNAH

## SYNOPSIS

This report is concerned primarily with a collection of Fulgoroidea made by members of the Royal Society Expedition to southern Chile (1958–1959), but the study has necessitated a revision of virtually the known Fulgoroid fauna of the region, some thirty-two species. Three genera and ten species are described as new. The fauna is found to comprise species with neotropical or holarctic affinities, together with some isolated taxa peculiar to southern Chile.

AMONG the insects collected by the Royal Society Expedition to southern Chile (1958–1959) were series in which four of the nineteen families of the Fulgoroidea were represented. In order to identify the species concerned, it was found necessary to revise the known Fulgoroid fauna of this area, and the opportunity has been taken of discussing material of little-known species from Valdivia and southern Argentina taken at different times by other collectors.

The writer's warmest thanks are tendered to Dr. G. Kuschel and Dr. M. W. Holdgate, both members of the Expedition, for the opportunity of examining their valuable and informative collections; to Mr. J. P. Doncaster, Keeper of the Department of Entomology, for the privilege of studying material in the accessions of the British Museum (Nat. Hist.), and also to Dr. A. Villiers for the loan of specimens from the Muséum National d'Histoire Naturelle, Paris.

The area of Chile with which this study is mainly concerned lies south of the 40th Parallel: its main faunistic and vegetational features have been discussed by Kuschel (1960) and the detailed features of the areas sampled by the Royal Society Expedition have been described by Holdgate (1960). Of the Chilean Fulgoroid material studied, that brought back by the Expedition was obtained in different vegetational zones, but the remainder came mostly from the Valdivian forest north of Puerto Montt.

The total assemblage of specimens included representatives of six families, Cixiidae, Delphacidae, Achilidae, Derbidae, Dictyopharidae and Issidae, but those of the last two were not found south of Ancud. Both in number of families and in number of species the Fulgoroid fauna shows impoverishment in the more southerly areas. The families Cixiidae, Delphacidae and Achilidae occur in all parts of the world, and are the last Fulgoroidea to disappear wherever the cool temperate zone reaches its colder extreme. Members of the first family are primarily root-feeders in the nymphal stages; of the Delphacidae, members of the tribe Delphacini feed mainly on grasses, sedges and rushes; those of the tribe Alohini usually feed on herbs and shrubs, and those of the subfamily Asiracinae often, if not invariably, feed on shrubs or woody herbs; the Achilidae, as far as is known, live in their immature stages under decaying bark; the Derbidae, which in the northern hemisphere do not penetrate so far north as the other families, regularly feed on fungus as nymphs and on fungus or phanerogams as adults. All these families attain their greatest development, in genera and species, in the warm temperate and tropical parts of the world.

Even in so small a collection as that discussed below, it is possible to recognize three features regarding faunal relationships ; firstly, that a moderate number of the Valdivian genera, and a few of the Magellanic, have representatives in the warmer parts of America ; next, that some genera in this fauna are not only restricted to the southern part of South America, but morphologically stand far apart from other genera in their family ; and finally, that of these Chilean fulgoroid genera only one can be recognized as being related to a genus in New Zealand, Tasmania or Australia.

The Valdivian genera with neotropical representatives include the cixiids *Pintalia* and *Mnemosyne*, the Achilids *Catonia* and the unexpected *Rhotala* (elsewhere known from Panama, the Philippine Islands and Australasia), and the Issid *Nubithia*. The Issids *Sarnus* and *Plagiopsis* seem close to *Thionia* and *Aphelonema*, respectively : the latter genus has not been recorded in Chile. The Magellanic genera represented elsewhere include *Catonia* and the Delphacid *Nothodelphax*. The latter is found in Tristan da Cunha, Gough Id., Falkland Is., Mexico, eastern U.S.A., southern Canada and northern Europe. The genus is compact ; most of the known species occur in the U.S.A., and the Chilean representative does not stand apart from the remainder in degree of morphological difference.

The genera peculiar to the region include four in the Dictyopharidae, *Chondrodera*, *Sicoris*, *Sicorisia*, and one described below as new, the Derbid *Goneokarella*, the Delphacids *Idiosystatus*, *Idiosemus*, *Calbodus*, and a Cixiid genus described below as new.

*Goneokarella* has a near relative in *Phrygia*, from Rio de Janeiro, but these two occupy a very sequestered position in the Derbidae. They have no Maorian relatives. The only Derbid in New Zealand is the very different *Eocenchrea maorica* Muir, and this finds its nearest relatives in species in Australia and New Caledonia.

Similarly, New Zealand has only one representative of the Achilidae, this being *Agandecca annectens* B. White. The genus is found only in New Zealand, and so far no other has been reported from Australia, Australasia or south America that can be confidently regarded as of the same stock.

In the Delphacidae the principal interest lies in the Asiracinae. There are no representatives of the subfamily in America north of Mexico ; in Central and South America there are seven genera, all far removed from one another. Two of them, *Idiosemus* and *Idiosystatus*, are restricted to the southernmost part of the continent, and occur in Chile. One of the remainder, *Ugyops* (s.l.) is well represented in the Brazilian subregion and in the Greater Antilles, and, outside America, occurs in the Mascarene Islands, the seaboard of S.E. Asia from Narkondam Id. to the Philippines, virtually all the Western Pacific Islands, Australia and in the North Island of New Zealand. But *Ugyops* does not occur in Hawaii, nor in the Marquesas Islands or any islands eastward of them, nor in Chile.

Apart from *Pintalia* and *Mnemosyne*, the Cixiid genera of southern Chile, as so far known, are endemic, and appear to have a broad affinity with Pintaliine genera. In New Zealand there are endemic genera of Cixiidae, and with only two exceptions

(*Tiriteana* and *Koroana*) they are unquestionably of Oliarine affinity. The only species in New Zealand that appear to belong to the Pintaliini include those of *Koroana* and three species currently ascribed to *Cixius*, namely, *C. aspilus* Wlk., *C. kermadecensis* Myers, and *C. punctimargo* Wlk. On present evidence, however, none of these can be accepted with complete assurance as congeneric with any species from Chile. The cosmopolitan *Oliarus* occurs in New Zealand, but has not been reported any nearer Chile than Buenos Aires. It is, however, not unlikely that its apparent absence from Chile is attributable to insufficient collecting.

The type specimens of new species described below are in the collection of the British Museum (Nat. Hist.). All bibliographic citations not listed in the references at the end of this report are given according to the usage in " A Bibliography of the Homoptera (Auchenorhycha) " by Z. P. Metcalf (N.C. State College of Agriculture and Engineering, University of North Carolina, 1942).

## Family **CIXIIDAE**

### ***MNEMOSYNE*** Stål

*Mnemosyne* Stål, 1866*a* : 150. Haplotype, *Mnemosyne cubana* Stål, 1866*a* : 391.

### ***Mnemosyne cixioides*** (Spinola) **comb. n.**

*Achilus cixioides* Spinola, 1852*a* : 246. *Atlas Zoologico, Hemipteros*, pl. 3, fig. 2, 2*a–d*.

### ***PINTALIA*** Stål

*Pintalia* Stål, 1862*e* : 4. Logotype, *Pintalia lateralis* Stål, 1862*e* : 4.

### ***Pintalia fasciolaris*** Blanchard **comb. n.**

(Text-figs. 1–8)

*Cixius fasciolaris* Blanchard, 1852*a* : 251.

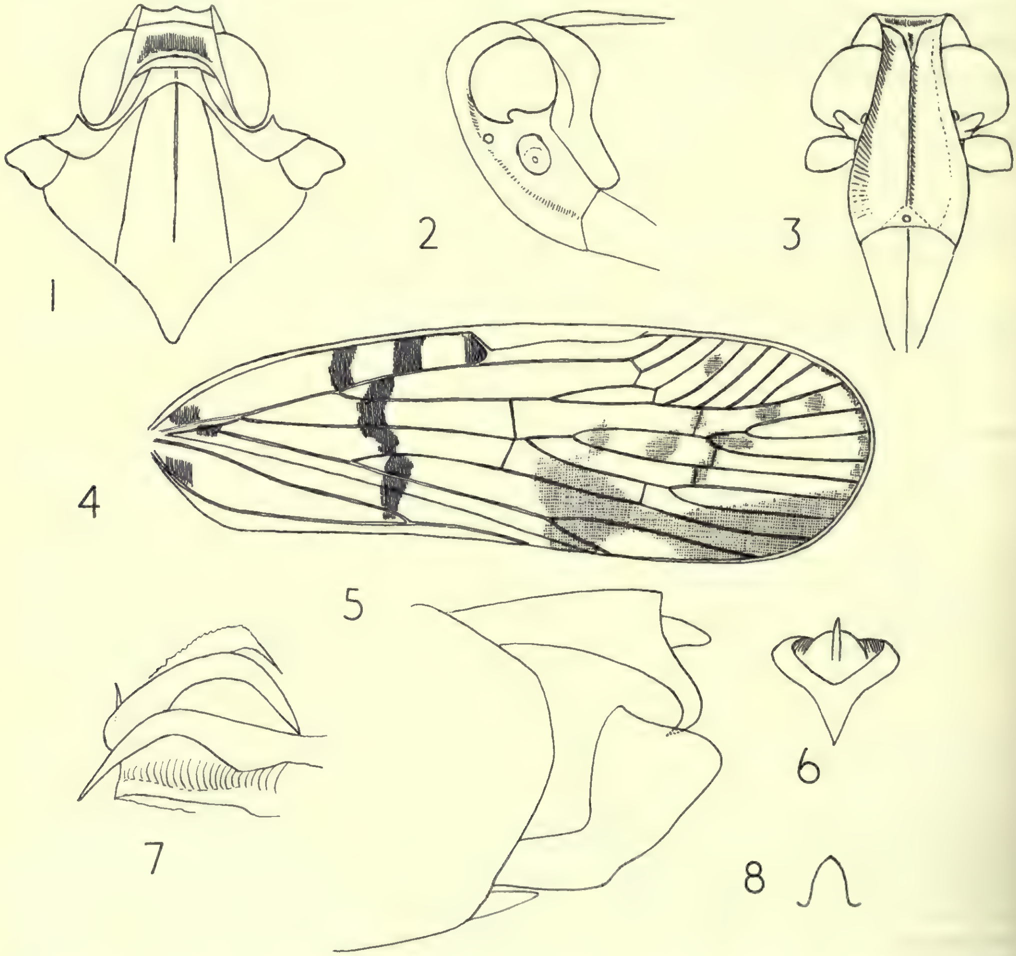
The figures are of the type in the Paris Museum. No other specimens have been seen by the writer. The only locality mentioned by Blanchard is Coquimbo.

### ***NOTOCIXIUS*** **gen. n.**

Type-species, *Cixius fulvicollis* Blanchard.

Vertex with a transverse carina apart from apical carina, not medially carinate between this carina and base, the transverse carina not, or at most obscurely, connected with anterior margin ; median carina of frons distinct, often shortly forked at base ; clypeus carinate medially and laterally ; lateral ocelli distinct, median ocellus usually so, eyes round, antennae with first segment very short, second segment shortly barrel-shaped. Pronotum short, anterior margin of disc truncate, posterior margin deeply excavate, lateral carinae of disc curving laterad behind eyes, a weak carina laterally between this carina and tegula, tegulae subcarinate. Post-tibiae unarmed or with one or two very small spines laterally, six spines apically in two groups of three, basal metatarsal segment with eight small teeth, the middle six each with a short narrow scale, second metatarsal segment with seven teeth, the middle five each with a short scale. A vertical obcordate plate above ovipositor.

This genus differs from *Cixius* in the tegmina being carried more steeply, in the frontoclypeal suture being almost transverse, and in the pregenital sternite of the female being transverse and relatively narrow, not large and triangular. It is rather like *Koroana*, but differs not only in the less arcuate frontoclypeal suture, but also in the anterolaterad inflection of the lateral carinae of the frons, in the tegmina being carried more steeply, and in the ovipositor being curved, not straight. *Koroana* is characterized by stout spines laterally on the post-tibiae and this may be associated with the relatively coarse build of its member species ; such spines do not occur in *Notocixius*, in which, if present at all, they are minute.



Figs. 1–8. *Pintalia fasciolaris* (Blanchard). 1, Vertex, pronotum and mesonotum ; 2, head in profile ; 3, frons and clypeus ; 4, tegmen ; 5, anal segment, pygofer and left genital style, lateral view ; 6, anal segment of male, posterior view ; 7, aedeagus (free hand sketch from undissected genitalia) ; 8, medioventral process of pygofer.

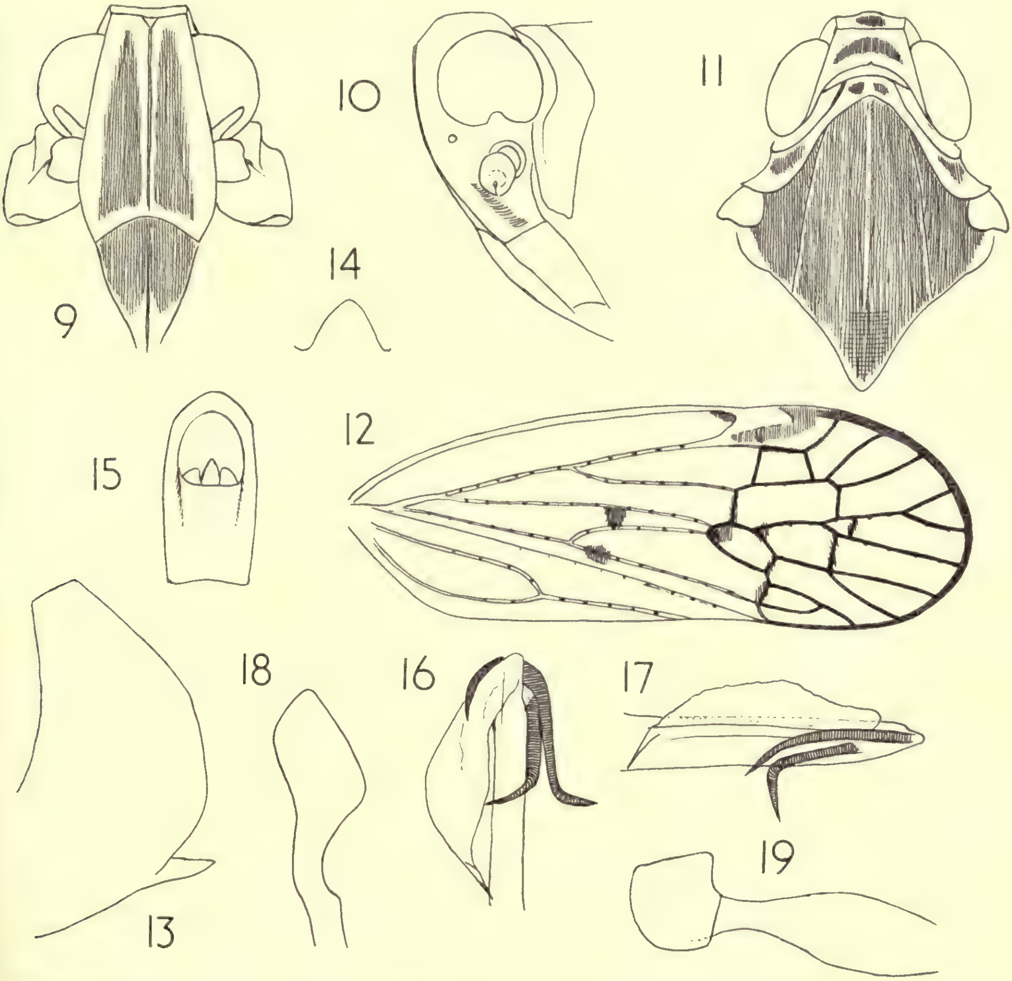
## ***Notocixius fulvicollis*** (Blanchard) **comb. n.**

(Text-figs. 9–19)

*Cixius fulvicollis* Blanchard, 1852*a* : 254.

CHILE : Llanquihue, Peulla, 1 ♂, 9.iii.1959 (*J. F. G. Clarke*).

The figures are based on the above specimen, which has been compared with the type in the Paris Museum. The species is most easily recognizable by the markings on the tegmina. The type locality is Carelmapu.



FIGS. 9–19. *Notocixius fulvicollis* (Blanchard). 9, Frons and clypeus ; 10, head in profile ; 11, vertex, pronotum and mesonotum ; 12, tegmen ; 13, pygofer ; 14, medioventral process of pygofer ; 15, anal segment of male ; 16, aedeagus, dorsal view ; 17, aedeagus, left side ; 18, genital style, posterior view ; 19, genital style, lateral view.

### ***Notocixius pallens*** (Blanchard) **comb. n.**

(Text-figs. 20–26)

*Cixius pallens* Blanchard, 1852*a* : 256.

The figures are of Blanchard's type. The type locality is given as Santiago.

### ***Notocixius adspersus*** (Blanchard) **comb. n.**

(Text-figs. 27–31)

*Cixius adspersus* Blanchard, 1852*a* : 257.

CHILE : Santiago, Cuesta Zapata, 1♂, 2 ♀, 30.xi.1947 (*G. Kuschel*).

With the exception of Text-fig. 31, the figures are of the male of this series, which has been compared with the type. The typical locality is Sotaqui in Coquimbo. This and *N. pallens* are readily recognizable by the relatively elongate form of the posterior compartment of the vertex.

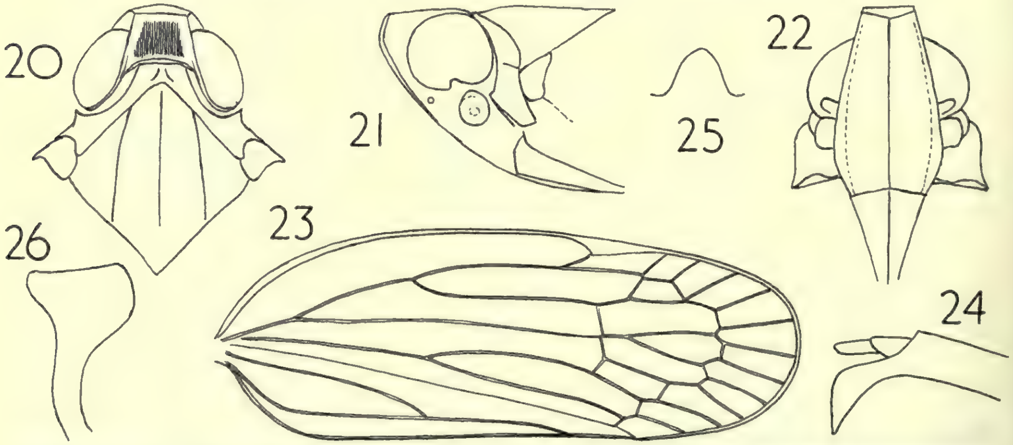
### ***Notocixius helvolus*** (Spinola) **comb. n.**

(Text-figs. 32–39)

*Cixius helvolus* Spinola, 1852*a* : 255.

CHILE : Llanquihue, Frutillar, 1 ♂, 1 ♀, 15.ii.1956 ; Volcan Calbuco, 200 m., 4 ♂, 1 ♀, 22.ii.1956 (*G. Kuschel*).

The males of this series are of a uniform clear yellow, with only a dilute smoky spot just distad of the apex of the clavus, but in one of the females the basal half of the tegmina is abruptly dark castaneous. This species broadly resembles the New Zealand *Cixius aspilus* Wlk. and *C. kermadecensis* Myers, but in these the clypeus is abnormally inflated and the transverse carina of the vertex is markedly convex, and the ovipositor of *C. kermadecensis* has a relatively small ovate ceriferous area.

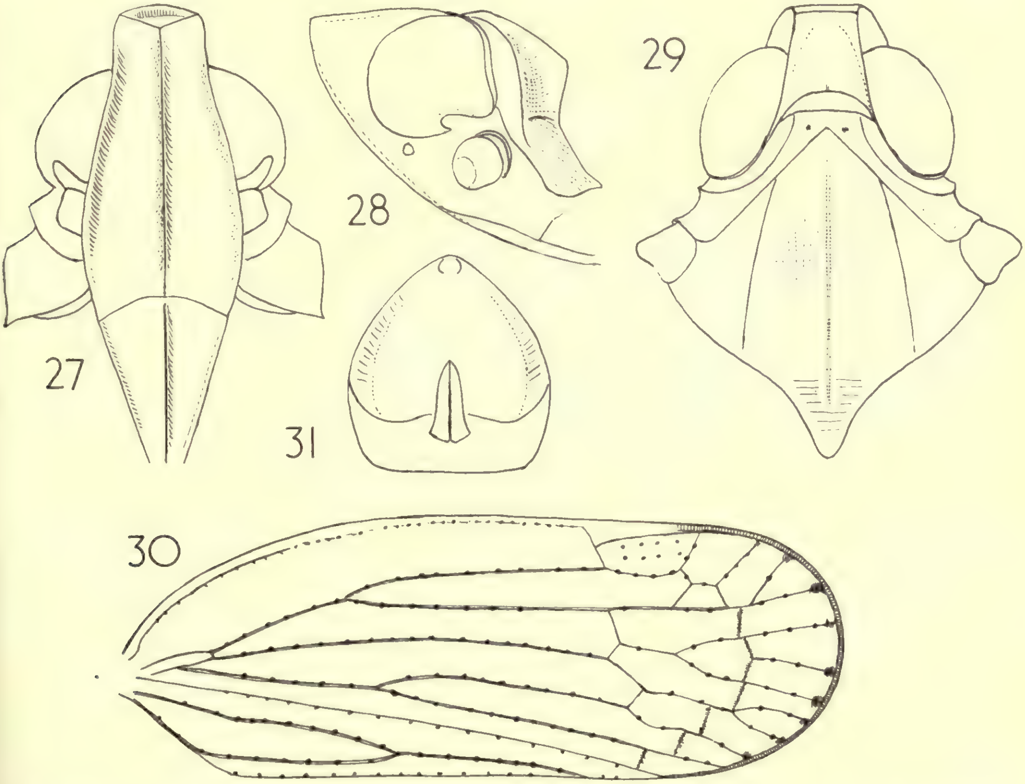


FIGS. 20–26. *Notocixius pallens* (Blanchard). 20, Vertex, pronotum and mesonotum ; 21, head in profile ; 22, frons and clypeus ; 23, tegmen ; 24, anal segment of male, right side ; 25, medioventral process of pygofer ; 26, genital style.

## *Notocixius tenebrosus* sp. n.

(Text-figs. 40–47)

♂. Vertex broader at anterior margin than long in middle line (about 4 : 1), a little wider at base than at apex, anterior margin truncate, lateral margins straight, posterior margin broadly excavate, disc rather deeply hollowed, obscurely medially carinate at extreme base; base of frons visible in dorsal view, frons longer than broad (nearly 1·4 : 1), basal margin straight, lateral margins diverging to level of antennae, thence incurved to frontoclypeal suture, which is slightly concave, disc carinate medially and at lateral margins, depressed between carina and with two or three obscure, ridge-like transverse elevations, median carina forked at one third from base, each arm meeting basal margin midway between middle line and lateral margin, median ocellus present; postclypeal portion of clypeus shorter than frons (about 1 : 2·8), carinate medially and laterally, anteclypeus about as long as postclypeus, rostrum fully attaining post trochanters, apical segment as long as subapical; lateral ocelli distinct; eyes round, first antennal segment very short, concealed, second segment globose. Pronotum narrow with anterior margin of disc transverse, posterior margin obtusely angulately excavate, disc feebly medially carinate, strongly depressed, lateral discal carinae following hind margin of eyes, a carina on each side between eye and tegula, outer angles of lateral lobes slightly acute; mesonotum with disc distinctly tricarinate, with traces of a pair of intermediate carinae; profemora and mesofemora rather



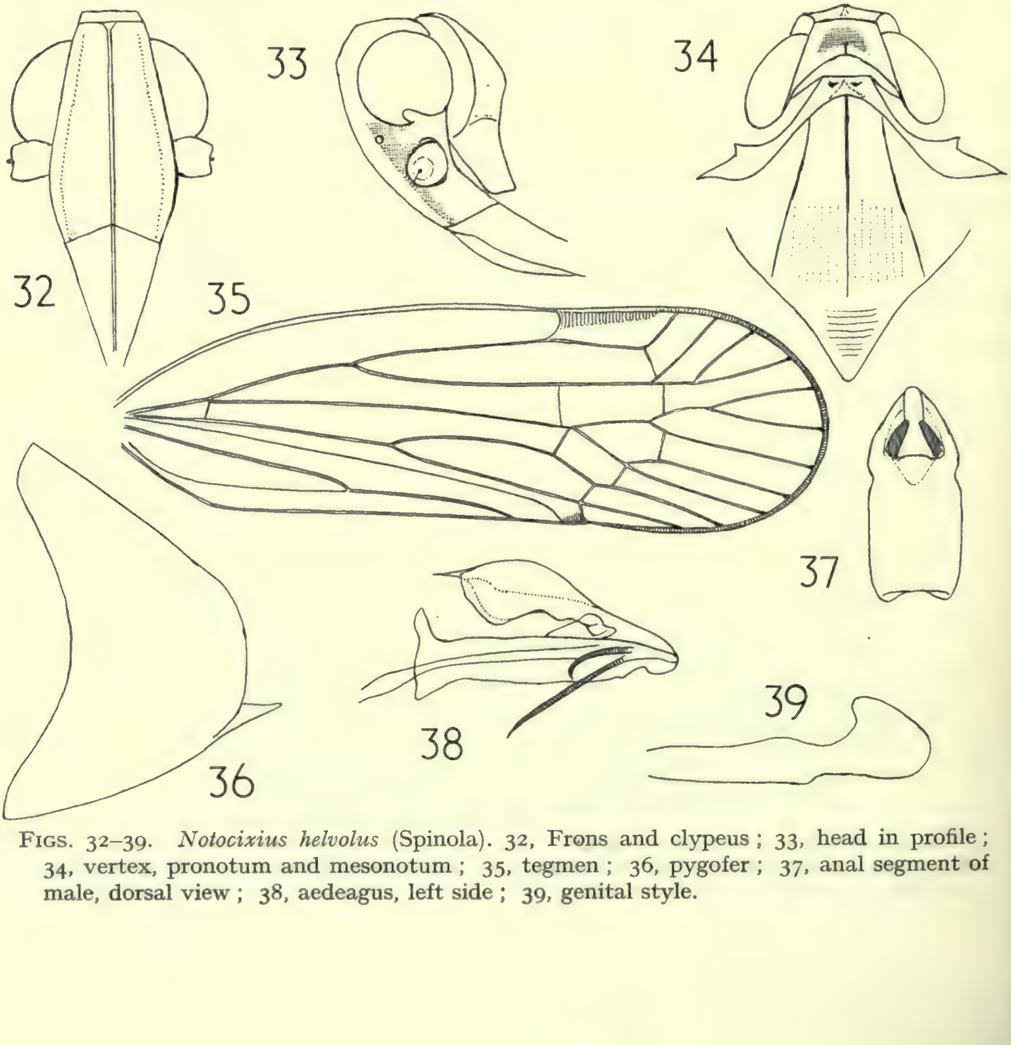
Figs. 27–31. *Notocixius adspersus* (Blanchard). 27, Frons and clypeus; 28, head in profile; 29, vertex, pronotum and mesonotum; 30, tegmen; 31, female genitalia, posterior view.

compressed ; post-tibiae laterally unarmed, apically with five teeth, basal post-tarsal segment apically with two stout and five small spines, second segment similarly adorned.

Piceous ; lateral margins of vertex, pronotum, tegulae, post-tibiae distally and post-tarsi, ferruginous or castaneous. Tegmina hyaline, veins and margin castaneous ; some suffusion in basal half, an ill-defined broad oblique fascia between stigma and apical part of clavus, and apical areoles except submarginally, castaneous. Wings hyaline, with dark castaneous veins.

Anal segment of male moderately long, in side view with central margin very shallowly concave, dorsal margin strongly decurved distad of anal foramen. Pygofer short dorsally, moderately long ventrally, in lateral view with posterior margin sinuately convex, laterodorsal angles not distinct, medioventral process triangular, prominent. Aedeagus tubular, a pair of long, shallowly curved spinose processes arising on each side at apex, directed ventrocephalad ; a shorter spinose process arising on left near apex, directed dorsocephalad and curving to right ; a slender long spinose process arising ventrally near apex directed cephalad, flagellum in repose reflected cephalad, comprising a narrow sinuate sclerotized limb in basal half, abruptly expanding into a broad granulate membrane in distal half ; a broad sclerotized plate arising ventrally on right of flagellum at base, descending ventrocephalad to left in basal half of aedeagus. Genital styles each narrow, L-shaped, with dorsal margin in basal half produced dorsad in a shallow setiferous eminence.

♂ : length, 2·9 mm. ; tegmen, 3·5 mm.



FIGS. 32–39. *Notocixius helvolus* (Spinola). 32, Frons and clypeus ; 33, head in profile ; 34, vertex, pronotum and mesonotum ; 35, tegmen ; 36, pygofer ; 37, anal segment of male, dorsal view ; 38, aedeagus, left side ; 39, genital style.

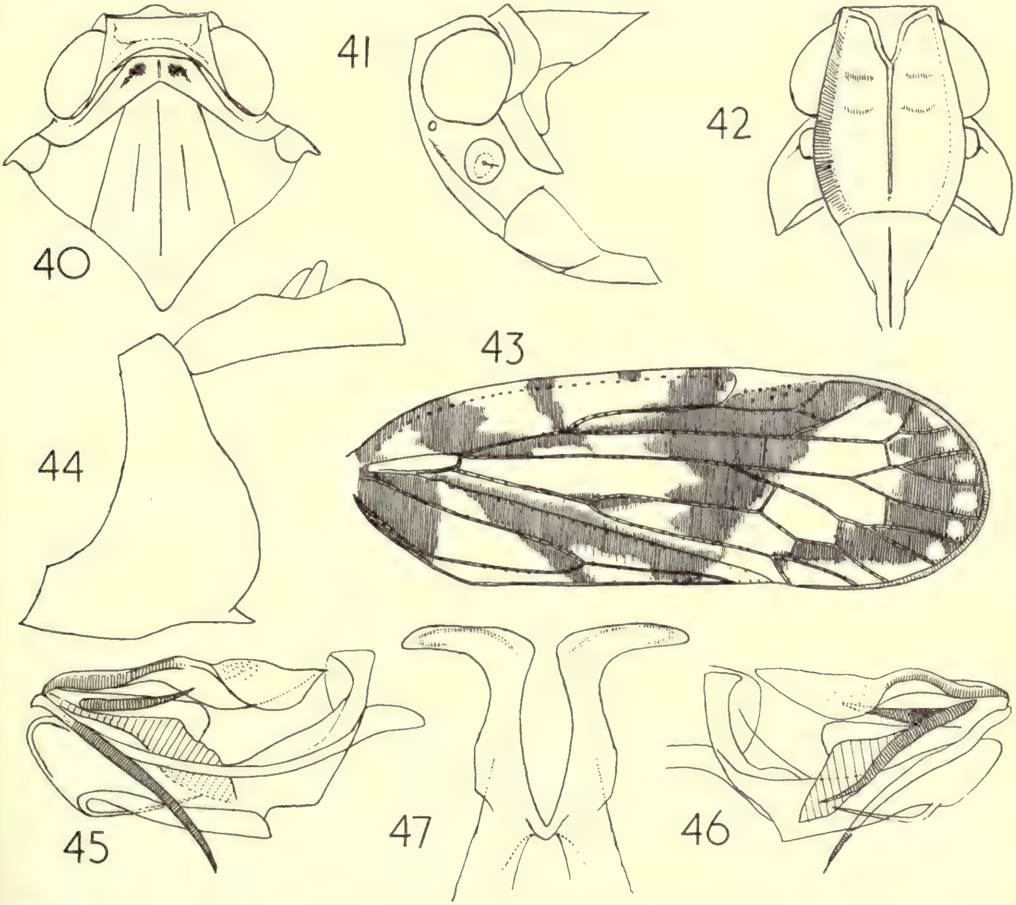
Holotype ♂. CHILE: Llanquihue Prov., Casa Panque, 4–10.xii.1926 (*F. & M. Edwards*), B.M. 1927–63.

This species is distinguished by the wide basal fork of the median frontal carina, the almost quinquecarinate mesonotum, the shape of the male genitalia, and the colour pattern of the tegmina.

### *Notocixius chepuanus* sp. n.

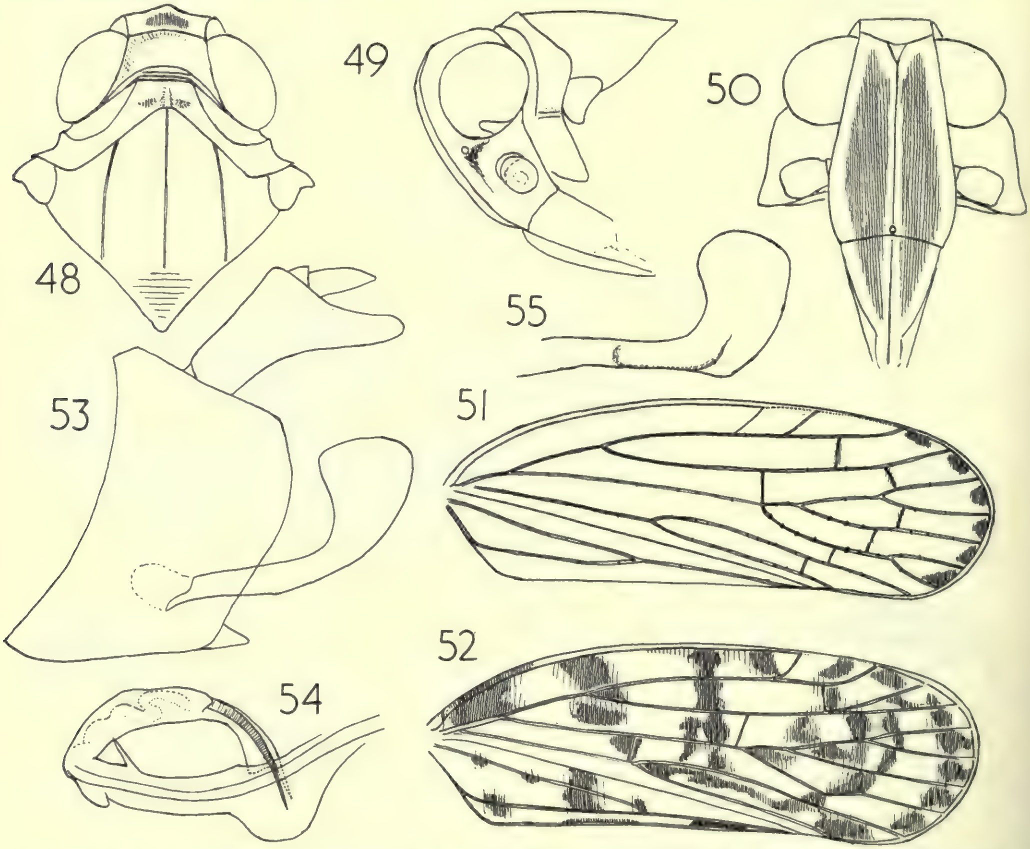
(Text-figs. 48–55)

♂ ♀. Head with eyes narrower than pronotum. Vertex between basal angles wider than long in middle line (1·6 : 1), anterior compartment strongly declivous, anterior margin angulately convex, lateral margins straight or weakly concave, posterior margin rather deeply roundly excavate, posterior compartment not as long as anterior, anterior compartment medially



FIGS. 40–47. *Notocixius tenebrosus* sp. n. 40, Vertex, pronotum and mesonotum; 41, head and thorax, lateral view; 42, frons and clypeus; 43, tegmen; 44, pygofer and anal segment, lateral view; 45, aedeagus, right side; 46, aedeagus, left side; 47, genital styles.

ecarinate, largely visible in anterior view ; frons longer in middle line than broad (1·3 : 1), basal margin shallowly angulately excavate, lateral margins diverging distad to below level of antennae, then moderately incurved to frontoclypeal suture, disc very shallowly depressed on each side of middle line, median carina distinct, moderately widely forked near base, median ocellus distinct at apex ; clypeus with basal margin shallowly convex, distinctly convex transversely, shallowly convex in profile, strongly carinate medially and laterally, median carina subfoliate ; rostrum distinctly surpassing post-trochanters, subapical segment slightly longer than apical ; antennae with basal segment very short, ring-like, second segment shortly cylindrical, wider at apex than at base, lateral ocelli distinct, eyes rounded. Pronotum short, anterior margin transverse, posterior margin rather strongly concave, disc medially carinate, lateral carinae curving laterad behind eyes ; mesonotum about as long as broad, with dorsal margin in profile sinuate, disc tricarinate ; post-tibiae laterally with a minute spine at base and one or two small spines at middle and apically with six spines, basal metatarsal segment with six small teeth, second segment with seven teeth. Tegmina longer than broad (3 : 1), with $Sc + R$ fork at about one-third from base, $Cu_1$ fork distinctly basad of middle of tegmen, *R-M* cross-vein distinct, *M-Cu* cross-vein obsolete, cross-vein between claval suture and anterior claval vein sometimes obscure, not in same line as *R-M* cross-vein.



FIGS. 48–55. *Notocixius chepuanus* sp. n. 48, Vertex, pronotum and mesonotum ; 49, head and thorax, lateral view ; 50, frons and clypeus ; 51, tegmen (male) ; 52, tegmen (female) ; 53, male genitalia, lateral view ; 54, aedeagus, right side ; 55, genital style.

Dark castaneous (male) or ferruginous (female); frons, clypeus and mesonotum almost piceous, lateral margins of frons, sides of vertex, labrum, carinae and hind margin of pronotum, femora and tibiae apically, and post-tarsi, stramineous or pale testaceous. Tegmina of male milky hyaline with a faint yellowish brown suffusion, veins almost concolorous, interruptedly yellowish brown on corium, distinctly brown in membrane, margin fuscous, pale at apices of veins, subapical areoles distally dilute ferruginous fuscous. Wings milky-hyaline, with veins fuscous.

♂. Anal segment of male moderately long, slightly expanding to middle, in side view with ventral margin concave in basal half, convex in distal half, apical margin viewed from above weakly convex, anal style moderately broadly cylindrical, not quite attaining apical margin. Pygofer rather long, in side view broadly convex, medioventral process about as broad as long, triangular, apically rounded. Aedeagus long, relatively slender, shallowly curved upward distad, a rather short slender spinose process dorsally, directed dorso-caudad, a quarter of length of aedeagus from apex, a broad median subquadrate lobe ventrally in basal half; flagellum rather narrowly tubular, of subequal width throughout, a long slender spinose process arising at middle on right, curved cephalad then ventrad, and a short slender spine at apex of flagellum. Genital styles rather long, in profile rather narrow and parallel sided in basal half, expanded into a subrectangulate lobe distally, with apical margin rounded-truncate.

♂: length, 3·3 mm.; tegmen, 4·0 mm.
♀: length, 4·0 mm.; tegmen, 4·0 mm.

Holotype ♀. CHILE: Chepu, 42° S. 16.x.58 (*G. Kuschel*).

Paratypes: 1 ♀, same data; Aisen, Rio Murta, 1 ♀, 25.i.1956 (*G. Kuschel*).

This species can be distinguished from all others in Chile and Argentina, except *P. fasciolaris* and perhaps *N. fulvicollis*, by the heavily mottled tegmina. From *P. fasciolaris* it can be separated by the anterior margin of the vertex being parallel to the transverse carina of the vertex, whereas it is more acutely angulate than the transverse carina in *P. fasciolaris*. In the latter species, the lateral margins of the frons curve in to the frontoclypeal suture more gently than in *N. chepuanus*, and accordingly the greatest width of the frons is a little more basad. The intercarinal areas of the frons of *P. fasciolaris* often show five darker spots in each, and there are faint traces of pitting in approximately corresponding positions. The intercarinal areas of the frons in *N. chepuanus* are smooth and uniformly coloured.

From *N. fulvicollis* the present species can be separated by the pattern of markings on the tegmina. The two species stand well apart in the form of the male genitalia.

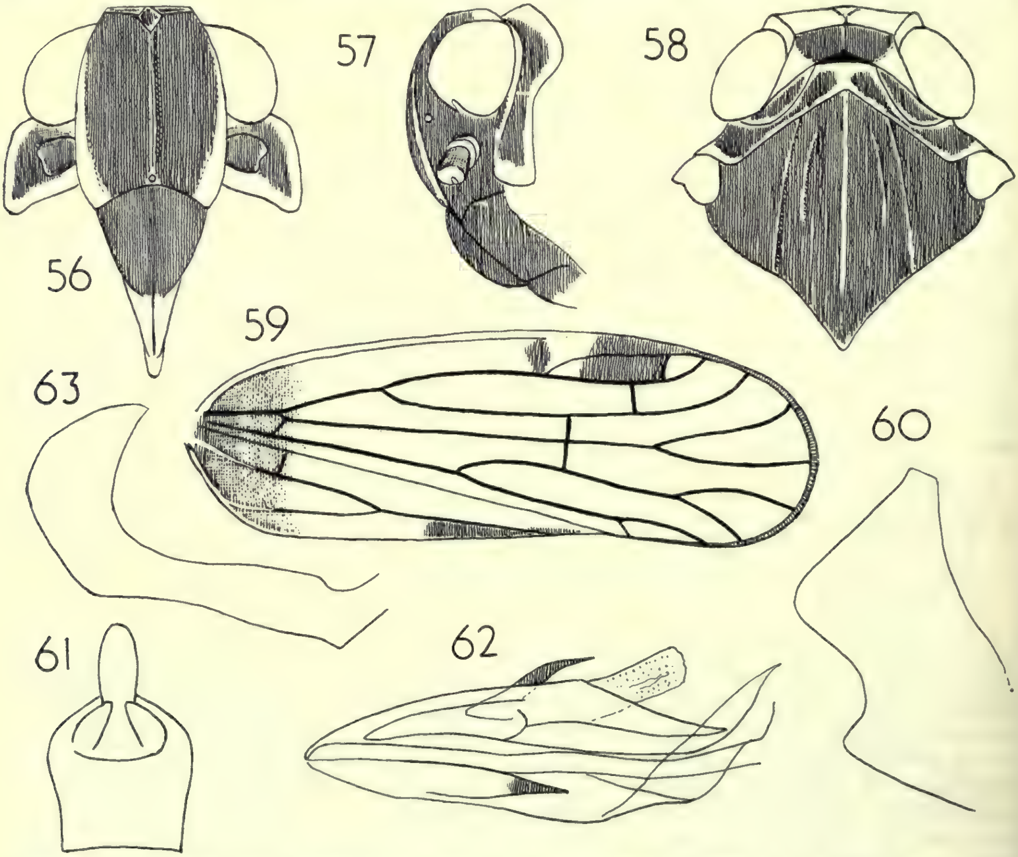
### ***Notocixius magellanicus* sp. n.**

(Text-figs. 56–63)

♂ ♀. Head with eyes narrower than pronotum. Vertex between basal angles wider than long in middle (2·4 : 1), declivous, anterior margin angulately convex, lateral margins markedly concave, posterior margin obtusely angulately excavate, posterior compartment of vertex as long as anterior compartment, the latter divided by a median carina, frons longer than broad (about 1·1 : 1), basal margin transverse, lateral margins diverging distad for most of their length, then strongly incurved to frontoclypeal suture, disc shallowly depressed on each side of middle line, median carina distinct, very widely forked near base, median ocellus distinct at apex; clypeus with basal margin shallowly convex, disc rather strongly convex transversely and in profile, finely but strongly carinate medially and laterally; rostrum attaining post-trochanters, apical segment about as long as subapical; antennae with basal segment very short, ring-like, second segment globose, lateral ocelli distinct, eyes rounded. Pronotum short, anterior margin transverse, posterior margin rather strongly concave, disc medially carinate, lateral carinae curving laterad behind eyes; mesonotum about as long as broad, with dorsal margin in profile sinuate, disc with three distinct longitudinal carinae and two intermediate carinae that vary in their distinctness; post-tibiae laterally unarmed, apically with six spines, basal metatarsal segment with five spines apically, second metatarsal with six. Tegmina with $Sc + R$ fork at about one-third from base, $Cu_1$ fork slightly basad of middle of tegmen, $R$-$M$ and $M$-$Cu$ cross-veins at same level, or nearly so, a cross-vein between claval suture and anterior claval vein.

Fuscous-piceous; lateral margins of frons, basal angles of vertex, labrum, second antennal segment ventrally, carinae and hind margin and lower margin of lateral lobes of pronotum, stramineous or pale yellow; all trochanters, postfemora at apex, tibiae distally, and basal two segments of post-tarsi, dilute fuscous or testaceous. Tegmina milky hyaline, a suffusion basally, stigma, a suffusion between common claval vein and posterior margin, dark fuscous; veins fuscous, posterior claval vein in part, and commissural margin from base to level of union of claval veins, sordid white. Wings hyaline, with fuscous veins.

♂. Anal segment of male distinctly short, in profile with ventral margin feebly concave, apical margin in dorsal view rounded-truncate, anal style moderately stout, cylindrical, much surpassing apical margin. Pygofer rather long, in side view posterior margin oblique, dorso-



Figs. 56–63. *Notocixius magellanicus* sp. n. 56, Frons and clypeus; 57, head in profile; 58, vertex, pronotum and mesonotum; 59, tegmen; 60, pygofer, right side; 61, anal segment of male; 62, aedeagus, right side; 63, genital style.

lateral angles each distinctly produced caudad in a deeply convex setiferous lobe, medioventral process moderately large, triangular, distally rounded. Aedeagus slender, porrect caudad, a spinose process on right at apex, extending cephalad for half length of aedeagus, this process in side view expanding to distal third, then tapering to apex; flagellum submembranous, almost parallel-sided, apically very obliquely truncate, a blade-like process arising on left near base, directed dorsocephalad. Genital styles long, slender and sinuate in basal two thirds, each rather abruptly expanding in distal third into an acute rounded-triangulate lobe, with a vertical ridge on its inner face from apex to ventral margin of style.

♂: length, 3·6 mm.; tegmen, 4·6 mm.
♀: length, 4·0 mm.; tegmen, 5·1 mm.

Holotype ♂. CHILE: I. Wellington, Puerto Eden, 400 ft., 13.xii.58 (*G. Kuschel*) in B.M. (N.H.).

Paratypes: CHILE: I. Wellington, Puerto Eden, 25–350 ft., 82 ♂, 62 ♀, 28–30.xi.58., under *Nothofagus nitida* (*M. W. Holdgate, G. Kuschel*); Isle Piazza, Lecky Retreat, 25 ft., 14 ♂, 14 ♀, 26.xii.58, *Nothofagus* forest; Gamero, Pena. Munoz, 20–40 ft., 14 ♂, 8 ♀, 27.xii.58, *Nothofagus antarctica* (*M. W. Holdgate*); Aisen, Rio Murta, 1 ♀, 25.i.56 (*G. Kuschel*).

This species is distinguished by the relatively broad vertex, the proportions of the frons, the shape of each element of the male genitalia, and by the pallid lower margins of the lateral lobes of the pronotum.

### ***Notocixius ophion*** **sp. n.**

(Text-figs. 64–73)

♂ ♀. Vertex about as broad at anterior margin as long in middle line, broader at level of middle of hind margin than long in middle line (not quite 1·4 : 1), anterior margin obtusely angulate, lateral margins shallowly concave, posterior margin broadly excavate, transverse carina feebly angulate, posterior compartment of disc rather deeply hollowed, finely medially carinate at extreme base; frons longer than broad (1·7 : 1), basal margin angulately excavate, lateral margins diverging to level of antennae, thence incurved to frontoclypeal suture, which is slightly concave, disc carinate medially and at lateral margins, depressed between carinae, median carina simple to base, median ocellus absent; postclypeal portion of clypeus shorter than frons (1 : 2·3), carinate medially and laterally, anteclypeus about as long as post-clypeus, rostrum slightly surpassing post-trochanters, apical segment about as long as subapical, lateral ocelli distinct, eyes round, first antennal segment very short, second segment in anterior view barrel-shaped. Pronotum narrow, with anterior margin of disc transverse, posterior margin obtusely angulately excavate, disc hollowed out on each side of middle line, lateral discal carinae following hind margin of eyes, a feeble oblique carina on each side between lateral discal carina and tegula, outer angles of lateral lobes in anterior view rectangulate; mesonotum with disc tricarinate, with a very obscure indication of sublateral carinae, profemora and mesofemora rather compressed, post-tibiae laterally unarmed or with a single minute spine, apically with six teeth in two groups of three, basal metatarsal segment with two stout and six small even teeth apically, second segment with two stout and seven small teeth apically, some of the latter bearing a narrow scale.

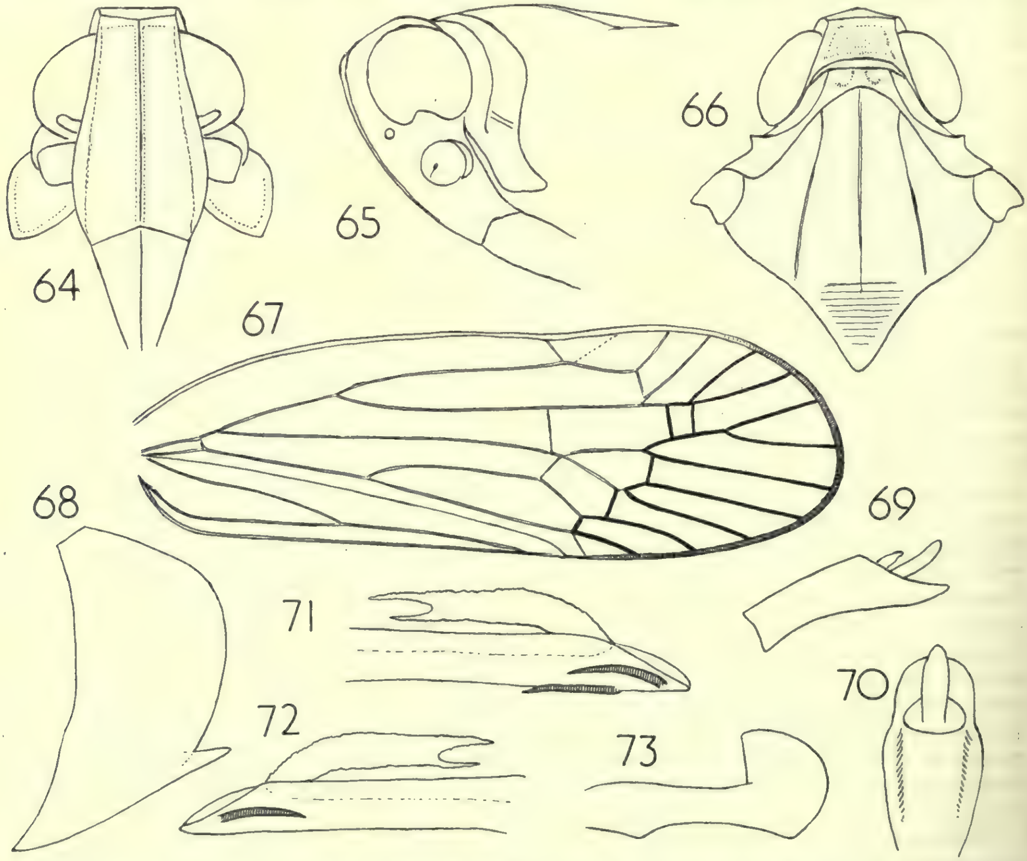
Castaneous; lateral carinae of frons and vertex, disc and posterior margin of pronotum, rostrum except at apex, pleura, postcoxae, post-trochanters, all tibiae and tarsi light testaceous or sordid stramineous disc of mesonotum ferruginous, except anteriorly. Tegmina hyaline, membrane faintly infumed distad of nodal line, veins of corium concolous, distal line of transverse veinlets, and all veins distad of this, and apical margin, fuscous. Wings hyaline, with brown veins.

♂. Anal segment of male moderately long, in side view with ventral margin shallowly sinuate, dorsal margin declivous distad of anal foramen, apical margin in dorsal view broadly convex. Pygofer short dorsally, rather long ventrally, in lateral view with posterior margin strongly convex, laterodorsal angles not distinct, medioventral process triangular, prominent. Aedeagus tubular, porrect, a pair of moderately long spinose processes arising laterally at apex, directed cephalad; a spinose process, of approximately equal length, arising ventrally on left subapically, directed cephalad and curving weakly to right, flagellum rather narrowly tubular, reflected cephalad in repose. Genital styles moderately long, relatively straight and approximately parallel-sided in basal three-quarters, expanding in distal quarter; apical margin strongly convex, apical angle subrectangulate.

♂: length, 4·1 mm.; tegmen, 5·5 mm.

Holotype ♂. CHILE: Volcan Calbuco, 200 m., 22.ii.1956 (*G. Kuschel*).

This species is most easily recognizable by the tegminal marking. It is separable from *N. helvolus* by its dark body colour; from *N. fulvicollis* and *N. chepuanus* by the



FIGS. 64–73. *Notocixius ophion* sp. n. 64, Frons and clypeus; 65, head and pronotum lateral view; 66, vertex, pronotum and mesonotum; 67, tegmen; 68, pygofer, left side; 69, anal segment, left side; 70, anal segment, dorsal view; 71, aedeagus, left side; 72, aedeagus, right side; 73, genital style.

absence of fuscous spots on the corium ; and from *N. pallens* and *N. adspersus* by the proportions of the posterior margin of the vertex.

## *CIXIOSOMA* Berg

*Cixiosoma* Berg, 1879*b* : 185. Haplotype, *Cixiosoma platense* Berg.

### *Cixiosoma platense* Berg

(Text-figs. 74–78)

*Cixiosoma platense* Berg, 1879*b* : 186.

ARGENTINA : Terr. Rio Negro, Viedma, 1 ♀, 23.x.1926 (*F. & M. Edwards*), B.M. 1927–63 ;

URUGUAY : Maldonado, 1 ♀ (*C. Darwin*), B.M. 1885–119.

### *Cixiosoma bonaerense* Berg

(Text-figs. 79–87)

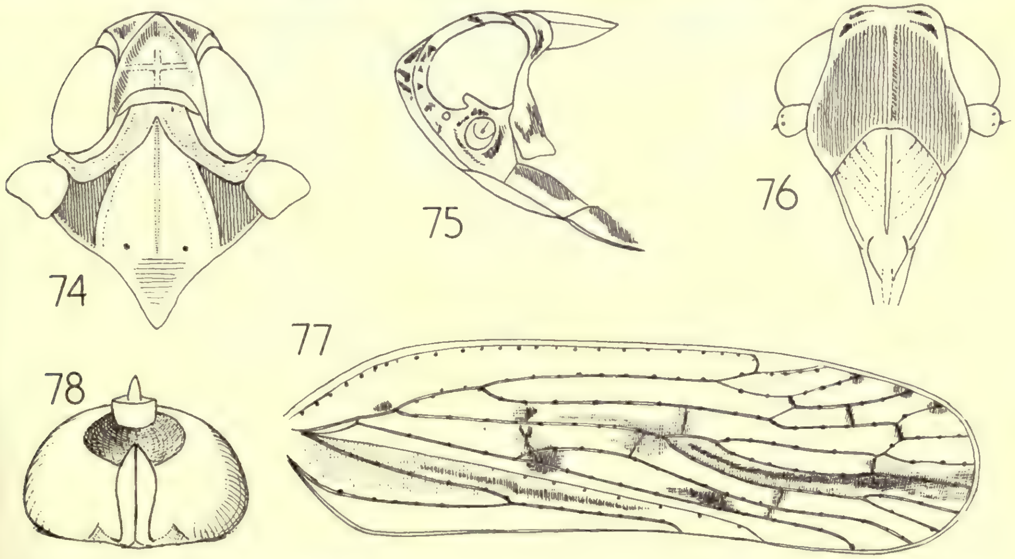
*Cixiosoma bonaerense* Berg, 1883 : 188.

ARGENTINA : Chaco, Roque Saenz Pena, 3 ♂, 5 ♀, 1932 (*K. J. Hayward*), B.M. 1933–58 ; Prov. Buenos Aires, 1 ♂, 2 ♀, 9.x.1899 (*S. Venturi*).

### *Cixiosoma caliginosum* sp. n.

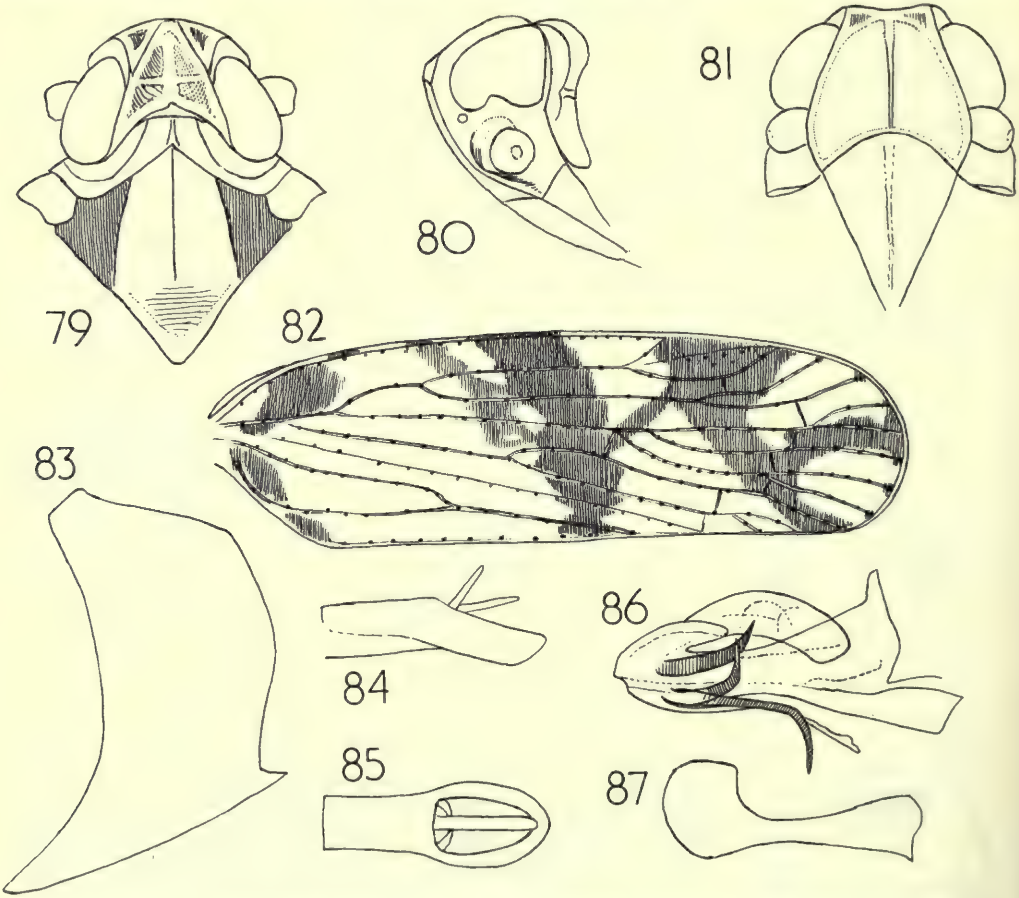
(Text-figs. 88–94)

♂ ♀. Vertex as long in middle line as broad at base of middle line, narrower at apex than at base, anterior margin subangulately convex, lateral margins diverging caudad, weakly obtusely angulately concave, basal margin approximately semicircularly excavate, disc rather hollowed



FIGS. 74–78. *Cixiosoma platense* Berg. 74, Vertex, pronotum and mesonotum ; 75, head in profile ; 76, frons and clypeus ; 77, tegmen ; 78, female genitalia, posterior view.

out, medially carinate only in basal half and divided transversely by a straight carina that is interrupted at its middle ; base of frons visible in dorsal view ; frons in middle line longer than broad at widest part (nearly 1·2 : 1), widest at level of antennae, basal margin very weakly convex, lateral margins sinuate, frontoclypeal suture rather strongly convex, median carina more strongly raised than lateral marginal carinae, a short arcuate carina at base uniting lateral margins to apex of vertex, and so demarcating a small triangular facet on each side of frons at base, median ocellus absent ; clypeus tricarinate, disc shallowly tectiform ; rostrum reaching to post-trochanters, apical segment shorter than subapical, eyes broadly ovate, with a very small excavation below, ocelli distinct. Pronotum short, anterior margin transverse, posterior margin acutely angulately excavate, lateral carinae of disc following hind margin of eyes, a short carina between eye and tegula on each side, outer angle of lateral lobes subacute ; mesonotum tricarinate, post-tibiae laterally trispinose, apically with six spines, basal post-tarsal segment with twelve small teeth, second segment broader between apical angles than long in middle, with about sixteen small scale-like teeth apically. Tegmina with $Sc + R$ and $M$ united at base, and forming a very short stalk, $Sc + R$ forked at about one-third from base, $M$ forked at level of nodal line,

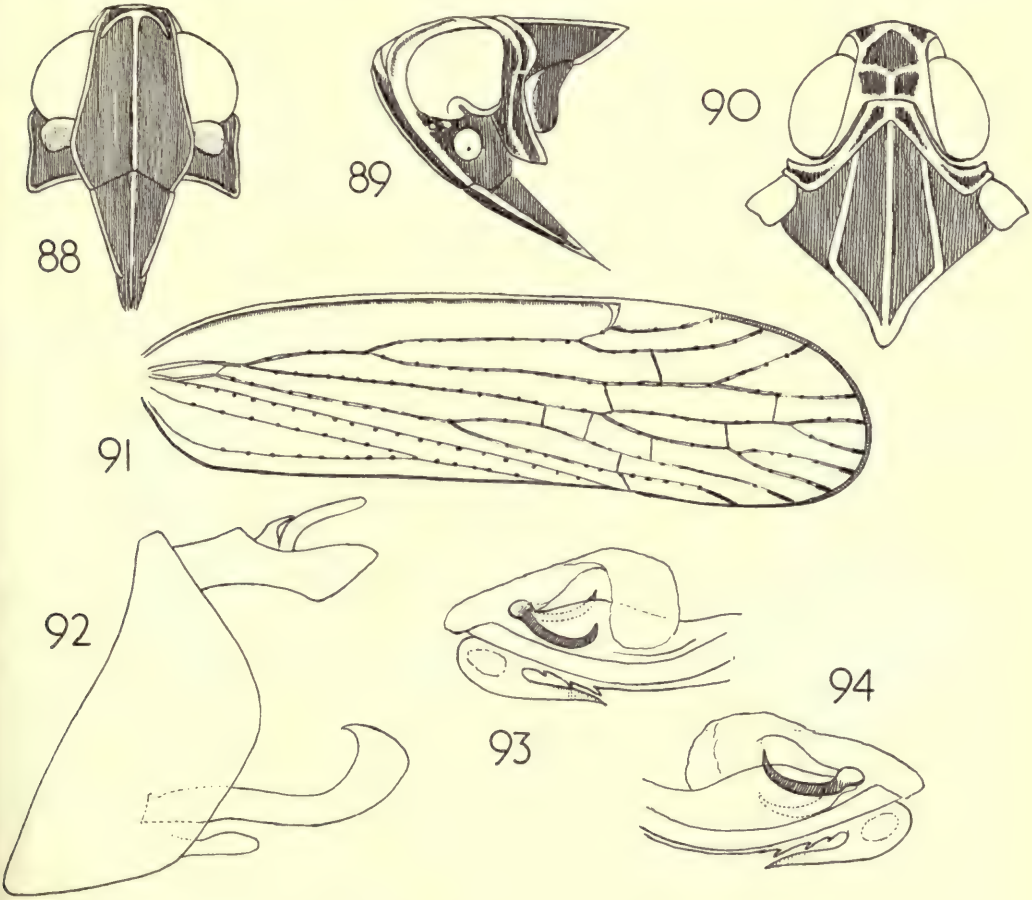


FIGS. 79–87. *Cixiosoma bonaerense* Berg. 79, Vertex, pronotum and mesonotum ; 80, head in profile ; 81, frons and clypeus ; 82, tegmen ; 83, pygofer, 84, anal segment, lateral view ; 85, anal segment, dorsal view ; 86, aedeagus, right side ; 87, genital style.

$Cu_1$ forked a little distad of $Sc + R$ fork, claval veins uniting at level of basal quarter of tegmen, basad of $Sc + R$ fork, all veins evenly and densely granulate.

Black ; all carinae, margins of legs, and tarsal segments apically, excepting the third segment, fulvous or orange-brown. Tegmina milky hyaline, veins stramineous, with castaneous granules.

♂. Anal segment of male moderately long, in side view with ventral margin concave in basal half, obtusely angulately convex in distal half, apical margin viewed from above rounded, medially excavate, anal style rather slender, attaining apical margin. Pygofer moderately long in side view with posterior margin broadly convex, laterodorsal angles not distinct, medioventral process about twice as long as broad, slightly tapering distad, deeply rounded at apex. Aedeagus subtubular, shallowly curved upward and expanding distad, phallobase dorsally longitudinally excavate, forming a shallow boat-like sclerite, and terminating in two spinose processes, one on each side, each about a quarter of total length of aedeagus, directed cephalad and curved upward at its tip, a stout spinose process arising just below apex, directed cephalad below aedeagus,



Figs. 88–94. *Cixiosoma caliginosum* sp. n. 88, Frons and clypeus ; 89, head in profile ; 90, vertex, pronotum and mesonotum ; 91, tegmen ; 92, anal segment, pygofer and left genital style ; 93, aedeagus, right side ; 94, aedeagus, left side.

flagellum expanding distad, distally submembranous, irregularly trumpet-mouthed at apex. Genital styles moderately long, rather narrow and sinuate in basal two-thirds, subquadrate in apical third, with apical angle shortly produced in a curved spinose process.

♂ : length, 4·1 mm. ; tegmen, 4·8 mm.
♀ : length 4·2 mm. ; tegmen, 5·0 mm.

Holotype ♂. CHILE : Chiloe, in swamp at end of Chepu, 14.x.58, bog vegetation, *Leptocarpus* (*M. W. Holdgate*).

Paratypes : 4 ♀, same locality, 3–11.x.58, *Leptocarpus* swamp, *Tepualia* scrub (*M. W. Holdgate*) ; 1 ♀, Ensenada, 14–15.xii.36 (*F. M. Edwards*).

This species is readily separable from *C. platense* and *C. bonaerense* by its relatively narrow frons, and its black ground colour. The wax-secreting area of the female genitalia is much larger in *C. caliginosum* than in either of the other two species.

## Family **DELPHACIDAE**

### ***IDIOSYSTATUS*** Berg

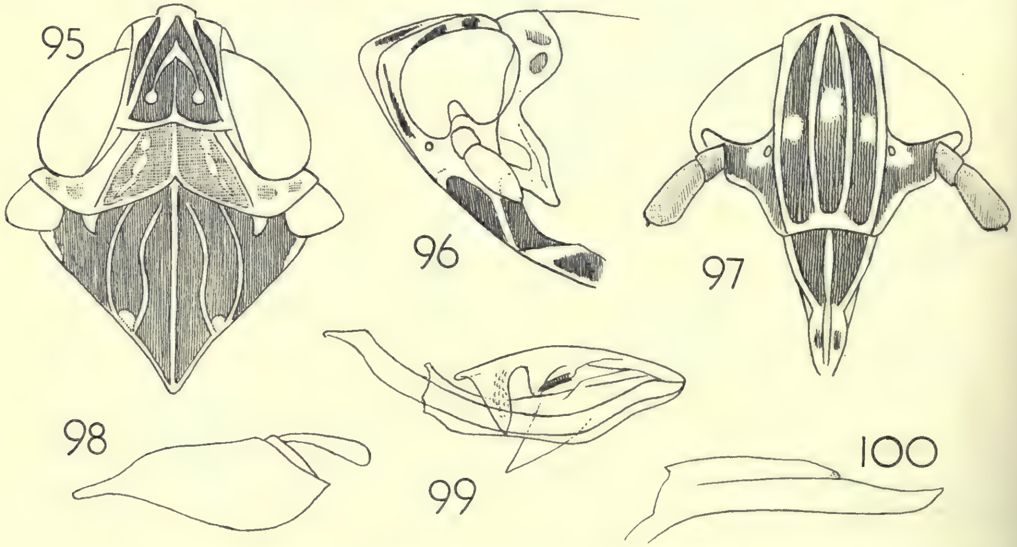
*Idiosytatus* Berg, 1883*b* : 231. Haplotype, *Delphax acutiuscula* Spinola.

### ***Idiosystatus acutiusculus*** (Spinola)

(Text-figs. 95–100)

*Idiosystatus acutiusculus* Spinola, 1852*a* : 258.

CHILE : Chepu, 11 ♂, 3 ♀, 21.x.58, 2 ♂, 4 ♀, 19.x.58, 1 ♀, 24.x.58 (*G. Kuschel*) ; 30 ft., 4 ♂, 3 ♀, 3, 11.x.58, *Leptocarpus* swamp, secondary scrub (*M. W. Holdgate*) ;



FIGS. 95–100. *Idiosystatus acutiusculus* (Spinola). 95, Vertex, pronotum and mesonotum ; 96, head in profile ; 97, frons and clypeus ; 98, anal segment, left side ; 99, aedeagus, left side ; 100, left genital style.

Coquimbo, Punta Teatines, 5 ♂, 5 ♀, 16.ix.52 (*G. Kuschel*); Santiago, Batuco, 5 ♂, 6 ♀, 21.xii.1955.

## *IDIOSEMUS* Berg

*Idiosemus* Berg, 1833*b* : 233. Haplotype, *Liburnia xiphias* Berg.
*Stenosystatus* Muir, 1930*f* : 214. Orthotype, *Stenosystatus anonymi* Muir. **syn. n.**

### *Idiosemus xiphias* (Berg)

*Liburnia xiphias* Berg, 1879*b* : 190.
*Stenosystatus anonymi* Muir, 1930*f* : 215 **syn. n.**

CHILE : Santiago, Bucalemu, 16 ♂, 9 ♀, 25.v.51 (*Peña*).

## *CALBODUS* Spinola

*Calbodus* Spinola, 1852*a* : 261. Haplotype, *Calbodus pallidulus* Spin.

This genus is very close to *Eurysa*, but at present can be separated by the relatively longer rostrum, of which the apical segment surpasses the mesotrochanters, and by the post-tibial spur, which, though relatively solid, bears a row of even teeth along the margin. The frons is relatively more elongate than in species of *Eurysa*, and the carinae are moderately distinct at the junction of vertex and frons.

### *Calbodus pallidulus* Spinola

*Calbodus pallidulus* Spinola, 1852*a* : 262.
*Delphacodes correntosoensis* Muir, 1929a : 80. **syn. n.**

CHILE : Chiloe, San Pedro, 42° S., 2,100 ft., 5 ♂, 6 ♀, 13.xi.58, forest edge scrub ; 2,000 ft., 1 ♂, 10.xi.58, *Nothofagus* forest ; 2,500 ft., 21.xi.58, 9 ♂, 4 ♀, grassland ; Volcan Calbuco, 200 m., 4 ♂, 22.ii.56 (*G. Kuschel*).

### *Calbodus patquianus* sp. n.

(Text-figs. 101–111)

♂ ♀. Vertex as long medially as broad at base, obtusely rounding into frons, very slightly narrower at apex than at base, lateral margins straight or shallowly concave, apical margin straight or feebly convex with submedian carinae weakly prominent, Y-shaped carina distinct, submedian carinae coarse, uniting at apex of vertex or at extreme base of frons, basal compartment of vertex wider at hind margin than greatest length (1·9 : 1) ; and than median length (2·3 : 1), frons in middle line longer than wide at widest part (about 1·6 : 1), widest at middle, lateral margins shallowly convex, median carina simple, or forked at extreme base, clypeus at base slightly wider than frons at apex, postclypeal disc as long as broad at base, in profile shallowly convex, anteclypeus in profile shallowly convex ; rostrum not reaching to post-trochanters, apical segment slightly shorter than subapical ; antennae slightly surpassing fronto-clypeal suture, basal segment longer than broad (1·6 : 1), second segment longer than first (1·8 : 1) ; ocelli distinct but small. Pronotum with disc shorter in middle line than broad at anterior margin (1 : 1·2), lateral carinae straight or weakly concave, not nearly attaining hind margin ; a few pustules present near each lateral margin. Total length of mesonotum greater than that of scutellum (2·6 : 1). Post-tibial spur shallowly tectiform, with twelve teeth, including a tooth at apex.

Dark testaceous or yellowish fuscous ; carinae of head and thorax, five to seven round spots in each compartment of frons, apical segment of rostrum, pustules on pronotum, post-tarsi distally and post-tibial spur, stramineous ; antennae, pleurites, pro- and mesocoxae, femora and tibiae, fuscous. Tegmina hyaline, veins concolorous.

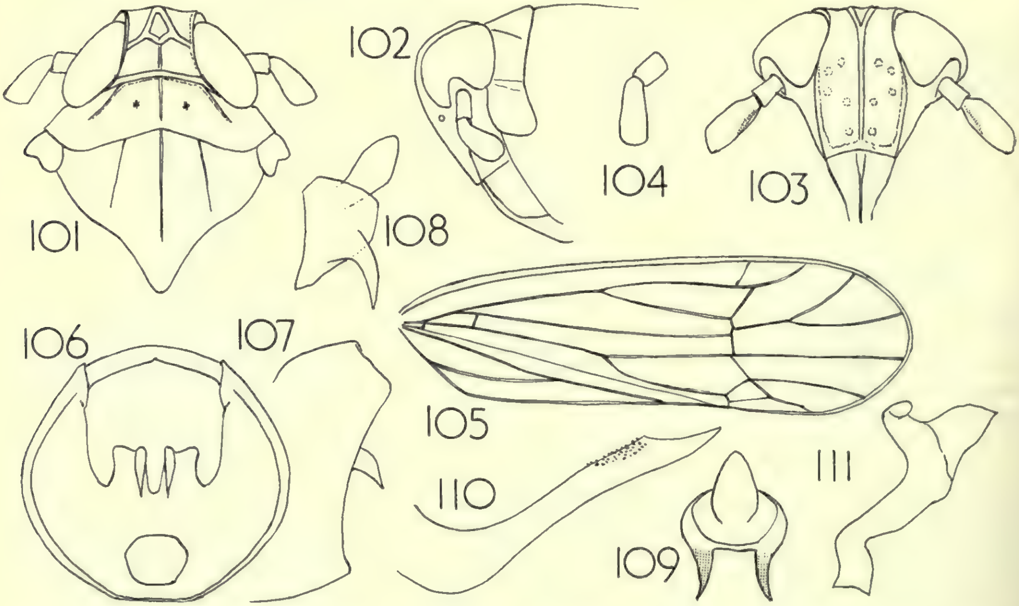
♂. Anal segment of male short, ring-like, lateroapical angles each produced ventrad in a spinose process that is weakly curved laterad near its apex. Pygofer moderately long, laterodorsal angles weakly produced, subrectangulate, no medioventral process present ; posterior opening of pygofer about as broad as long, diaphragm medially rather wide, with dorsal margin horizontal, abruptly and deeply incised at middle, the margin on each side of the incision at its base produced ventrad in a spinose process. Aedeagus relatively long and narrow, tubular, bent upward through about 45 degrees near base, thence almost straight to apex, a dense group of minute denticles subapically on upper surface, orifice terminal, oblique, with lower margin produced. Genital styles relatively large, in posterior view extending laterad then dorsad, widening distad of middle, broadly bifurcate at apex.

♂ : length, 2·7 mm. ; tegmen, 3·0 mm.
♀ : length, 3·1 mm. ; tegmen, 3·6 mm.

Holotype ♂. Argentina : Patquia, La Rioja, 1.1933 (*K. J. Hayward*), Brit. Mus. 1933–187.

Paratype ♀ : same data.

This species is placed in *Calbodus* with some hesitation on account of differences in bodily proportions that, in sum, separate this species very markedly from *C. pallidulus*.



Figs. 101–111. *Calbodus patquianus* sp. n. 101, Vertex, pronotum and mesonotum ; 102, head in profile ; 103, frons and clypeus ; 104, antennae ; 105, tegmen ; 106, pygofer, posterior view ; 107, pygofer, lateral view ; 108, anal segment, lateral view ; 109, anal segment, posterior view ; 110, aedeagus ; 111, genital style.

Without further information regarding the extent of variation in *Calbodus*, it would seem premature to define the genus rigidly by the characters exhibited by the type-species.

This species is well distinguished by the characters of a speckled frons and pustulate pronotum in combination with those shown by the male genitalia.

## ***NOTHODELPHAX*** Fennah

*Nothodelphax* Fennah, 1963*a* : 15. Orthotype, *Liburnia foveata* Van Duzee, 1894*e* : 192.

### ***Nothodelphax atlanticus*** (China) **comb. n.**

(Text- figs. 114–116)

***Delphacodes atlanticus*** China, 1958 : 5.

### ***Nothodelphax atlanticus nigrescens*** **ssp. n.**

(Text-figs. 112, 113, 115, 117)

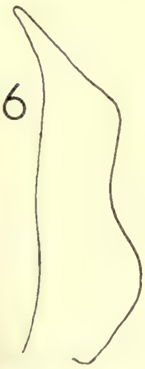
♂ ♀. Vertex as long as broad at base.

Intercarinal areas of frons, clypeus, genae in anterior half, abdomen except mediodorsally and laterally, pygofer except dorsally, anal style in both sexes, and ovipositor, piceous ; femora and tibiae with fuscous stripes ; first valvifers yellowish fuscous, abdominal terga of female yellowish brown except along middle line. Tegmina (brachypterous) translucent, ochraceous or suffused with yellowish brown, veins concolorous ; (macropterous) sordid yellowish translucent, marginal veins ferruginous or fuscous.

♂ (brachypterous) : length, 2·7 mm.

♀ : length 3·2 mm. ; tegmen, 3·8 mm.

Holotype ♂ of subspecies. CHILE : Isla Wellington, Puerto Eden, 60 ft., 6.xii.58 (*G. Kuschel*), in B.M. (N.H.).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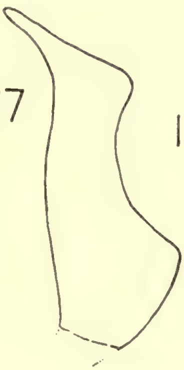
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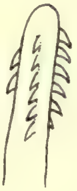
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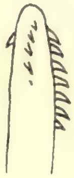
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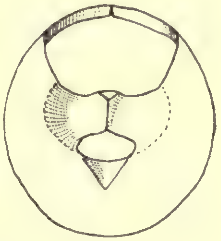
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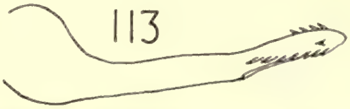
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FIGS. 112, 113, 115, 117. *Nothodelphax atlanticus nigrescens* subsp. n. 112, Pygofer, posterior view ; 113, aedeagus, left side ; 115, apex of aedeagus ; 117, genital style.

FIGS. 114, 116. *Nothodelphax atlanticus atlanticus* China. 114, Aedeagus ; 116, genital style.

Paratypes: 4 ♂, 3 ♀, same data, in scrub, grassland, sedge. Chiloe I., San Pedro, 42° S., 2,100ft., 2 ♂, 1 mutilated specimen, 13.xi.1958, forest edge scrub; Navarino I., Port Williams, 1 ♂, 3.ii.59, swept in *Marsippospermum* swamp.

Morphologically there is comparatively little difference between material of *N. atlanticus* from Chile, Falkland Is., Gough Id., and Tristan da Cunha, and such differences as have been noted (in colour pattern and in the shape of the genital styles) are here interpreted as being of less than specific value, on the grounds that other species in the genus differ from one another quite evidently in other characters such as aedeagal structure, as well as more distinctly in the form of the genital styles.

Although the present subspecies is distinctly darker than the typical subspecies, it does not closely resemble *N. foveata subfoveata* (Muir), which, apart from its more contrasting coloration, has a relatively shorter vertex and a male anal segment with the spinose processes rather close to one another.

The genus includes several North American species, for which new combinations are given below.

### ***Nothodelphax gillettei*** (Van Duzee) **comb. n.**

*Liburnia gillettei* Van Duzee, 1897*a*: 258.

### ***Nothodelphax consimilis*** (Van Duzee) **comb. n.**

*Liburnia consimilis* Van Duzee, 1897*a*: 249.

### ***Nothodelphax occlusa*** (Van Duzee) **comb. n.**

*Liburnia occlusa* Van Duzee, 1897*a*: 256.

### ***Nothodelphax neocclusa*** (Muir & Giffard) **comb. n.**

*Delphacodes neocclusa* Muir & Giffard, 1924*a*: 22.

### ***Nothodelphax lineatipes*** (Van Duzee) **comb. n.**

*Liburnia lineatipes* Van Duzee, 1897*a*: 255.

## Family **DERBIDAE**

### *GONEOKARELLA* Fennah

*Goneokarella* Fennah, 1952*a*: 142. Type-species, *Goneokarella maculivenis* Fennah.

### ***Goneokarella maculivenis*** Fennah

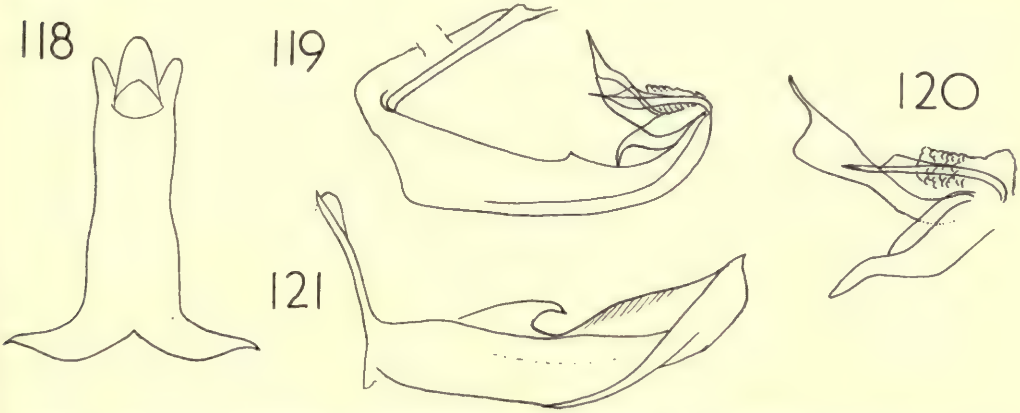
(Text-figs. 118–121)

*Goneokarella maculivenis* Fennah, 1952*a*: 142.

♂. Anal segment of male in dorsal view longer than broad at middle (about 3 : 1), broad at extreme base, parallel-sided for most of length, apical margin deeply excavate, anal foramen situated near apex, anal style rather short, surpassing apical margin. Pygofer short, moderately long ventrally. Aedeagus rather long, tubular, tapering distad, three pairs of processes arising dorsally at apex, reflected anteriorly; the first pair rather broad, directed ventro-cephalad, strongly narrowing distad of middle to a blunt point at apex ; the second pair directed dorsocephalad, rather narrow, widening distally, then abruptly narrowing, slender and acuminate at apex ; the third pair directed cephalad, also rather narrow at base, gradually widening distad, rather abruptly narrowing at two-thirds from base, acute apically ; a short subgranulate membranous lobe overlying all three pairs of processes basally. Genital styles long, slightly bent upwards in distal half, apical angle acute ; a broad-based spinose process arising dorsally a little basad of middle, directed caudad, shallowly decurved and acuminate at tip.

CHILE : Isla Wellington, Puerto Edén, 25 ft.–1,200 ft., 43 ♂, 32 ♀, 29.xi–6.xii.58, *Nothofagus* forest, *Pernettya*, sedge and heath (*M. W. Holdgate, G. Kuschel*) ; Isla Chiloe, San Pedro, 600 ft.–2,100 ft., 3 ♂, 5 ♀, 13–15.xi.58 (*M. W. Holdgate, G. Kuschel*) ; Isla Piazza, Lecky Retreat, 25 ft., 1 ♀, 26.xii.58 (*M. W. Holdgate*).

This genus and *Phrygia* Stål (of which the haplotype, *P. fuscata* Stål, is from Brazil) occupy an isolated position in the Cenchreine Derbidae.



FIGS. 118–121. *Goneokarella maculivenis* Fennah. 118, Anal segment of male ; 119, aedeagus, left side ; 120, apex of aedeagus, left side ; 121, left genital style.

## Family **ACHILIDAE**

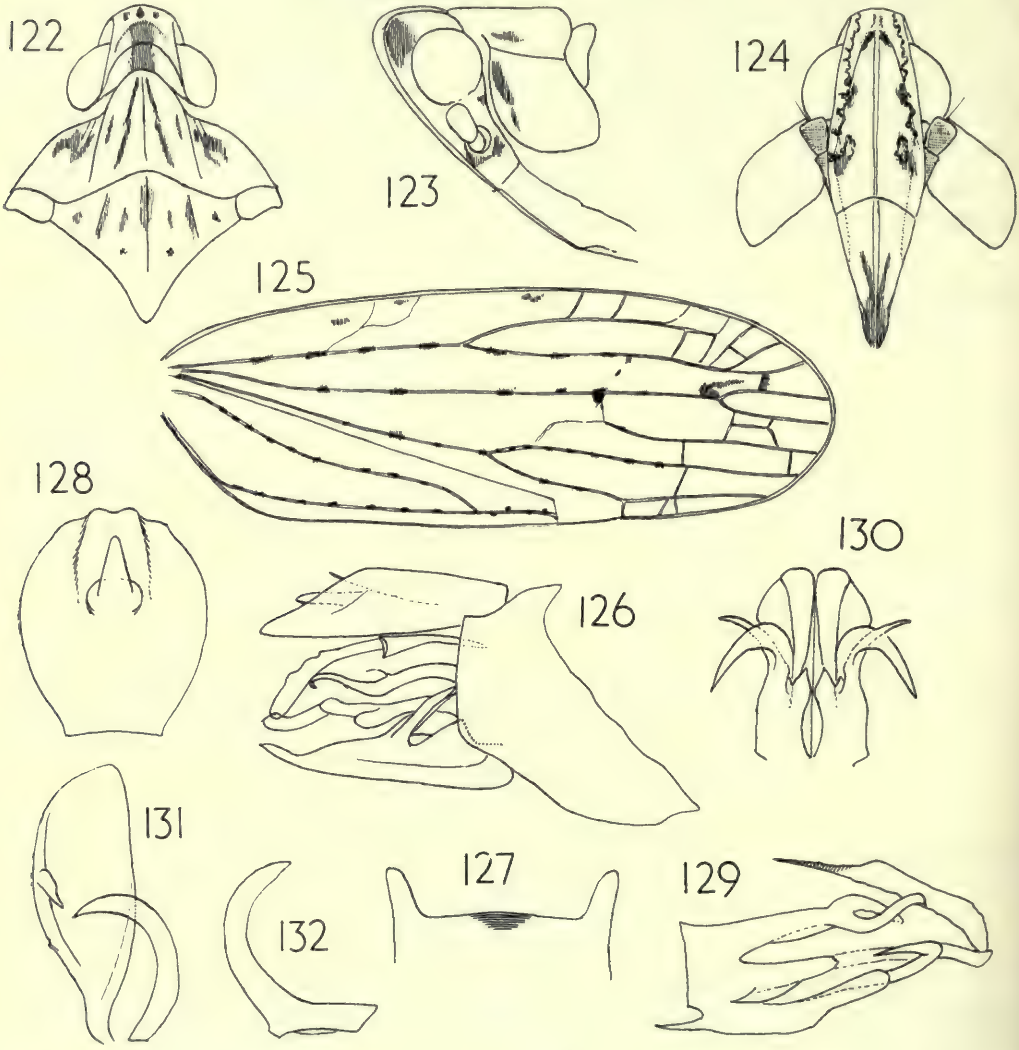
### ***RHOTALA*** Walker

*Rhotala* Walker, 1857*b* : 152. Haplotype, *Rhotala delineata* Walker, 1857*b* : 152.

### ***Rhotala valdiviana* sp. n.**

(Text-figs. 122–132)

♂. Vertex wider at base of middle line than long medially (about 1·6 : 1) ; anterior margin shallowly convex, lateral margins slightly converging distad, basal margin almost semicircularly excavate, median carina represented by a callus ; no carina separating vertex from frons ; frons longer than broad (2 : 1), basal margin feebly convex, lateral margins gradually diverging to below level of antennae, then incurved to frontoclypeal suture, disc rather narrowly depressed on each side of middle line, the depressed area widening distad ; clypeus shorter than frons (1 : 1·3), disc flat, carinate coarsely in middle and finely at lateral margins , rostrum with subapical segment attaining post-trochanters, apical segment reaching to base of pygofer ; eyes rounded, a little emarginate ventrally ; ocelli distinct ; antennae with basal segment short, ring-like, second segment pyriform. Pronotum with disc almost as long medially as broad at base, tricarinate, a distinct carina on each side between eye and tegula. Post-tibiae laterally with five spines, apically with four large spines and one very small spine ; basal metatarsal segment with nine teeth apically, one or two smaller than the others ; second segment with eight teeth. Tegmina slightly surpassing abdomen, $Sc + R$ fork, $Cu_1$ fork and union of claval veins at approximately same level. Wings not quite reaching to apex of abdomen.



FIGS. 122–132. *Rhotala valdiviana* sp. n. 122, Vertex, pronotum and mesonotum ; 123, head and pronotum, lateral view ; 124, frons and clypeus ; 125, tegmen ; 126, male genitalia, lateral view ; 127, posterior ventral margin of pygofer ; 128, anal segment of male, dorsal view ; 129, aedeagus, left side ; 130, aedeagus, ventral view ; 131, left genital style and associated spinose appendage, dorsal view ; 132, spinose appendage of genital style, lateral view.

Ochraceous ; head and thorax with linear markings as shown in figure, pleurites and coxae in part, four rings on each femur and tibia of fore and middle legs, pro- and mesotarsal segments, distally, castaneous ; ventrites sublaterally dark yellowish brown, dark fuscous on posterolateral margins. Pygofer dark castaneous laterally, lighter castaneous at base ventrally, genital styles yellowish brown distally. Tegmina ochraceous, veins more or less regularly flecked with small castaneous spots, or very narrowly overlain with a percurrent castaneous line. Wings ochraceous hyaline.

Anal segment of male relatively large, broadly sub-ovate, shallowly decumbent on each side of middle, anal foramen situated at middle, a broad deep channel extending from this point to apical margin. Pygofer moderately long, in lateral view extending farther caudad dorsally than ventrally, dorsolateral angles rectangulate, lateral margin straight in upper half, broadly excavate in lower half, ventral margin entire, convex. Aedeagus broadly tubular at extreme base, abruptly dividing distally into two rami, one above the other ; the dorsal limb tubular, slightly depressed, membranous distally, a pair of strongly sinuate spinose processes arising about two-thirds from base, each directed ventrocaudad, then dorso-caudad, finally laterad ; the lower limb tubular, a pair of stout dorsally-compressed spinose processes emerging near apex, each curved laterad then cephalad ; aedeagal appendages rather narrowly tubular, surpassing apex of aedeagus by about a quarter of their length, each bearing at apex a broad thin flattened flagellum reflected cephalad, and produced distally into a slender tapering spinose process that crosses its counterpart in the middle line. Genital styles about twice as long as broad, lower margin in ventral view very weakly sinuate, dorsal margin in ventral view broadly convex, in lateral view, produced dorsad in basal quarter in a triangulate lobe with a short stout tooth on its outer face, distad of this lobe a large spinose process directed dorsocephalad ; mesad of genital styles, and approximated to their bases, though not attached, a pair of large stout scimitar-like processes, each produced mesad one-third from base in a shallow triangulate lobe.

Holotype ♂. CHILE : Volcan Calbuco, 200 m., Rio Peseado, 22.xi.56 (*G. Kuschel*).

Paratype : 1 nymph, CHILE : Chiloe, Chepu, 42° S., 30 ft., 21.x.58, *Tepualia* forest (*M. W. Holdgate*).

This species is distinguished from the Panamanian *R. ambigua* Fowler, the only other species found in the Americas, by its brachypterous form, by the shorter disc and longer occipital portion of the vertex, by the relatively shorter median disc of the pronotum, and its evenly curved lateral margins (which are almost straight in *R. ambigua*) and by the larger number of teeth on the hind margin of the basal two post-tarsal segments, the numbers being 5, 5 in the type of *R. ambigua*, and also in the Oriental species with which it was compared (*R. nebulosa* Dist., *R. funesta* Wlk., *R. delineata* Wlk., *R. albopunctata* Dist., and *R. philippinensis* Dist.).

## ***CATONIA*** Uhler

*Catonia* Uhler, 1895*a* : 61. Logotype, *Catonia intricata* Uhler, 1895*a* : 61.

### ***Catonia ornatipennis*** Blanchard **comb. n.**

(Text-figs. 133–138)

*Cixius ornatipennis* Blanchard, 1852*a* : 252.

CHILE : Isla Wellington, Puerto Edèn, 49° S., 2 ♂, 30.x.58 (*G. Kuschel*), 40 ft., 6.xii.58, in *Nothofagus* forest (*M. W. Holdgate*) ; Aisén, Rio Murta, 1 ♂, 25.i.56

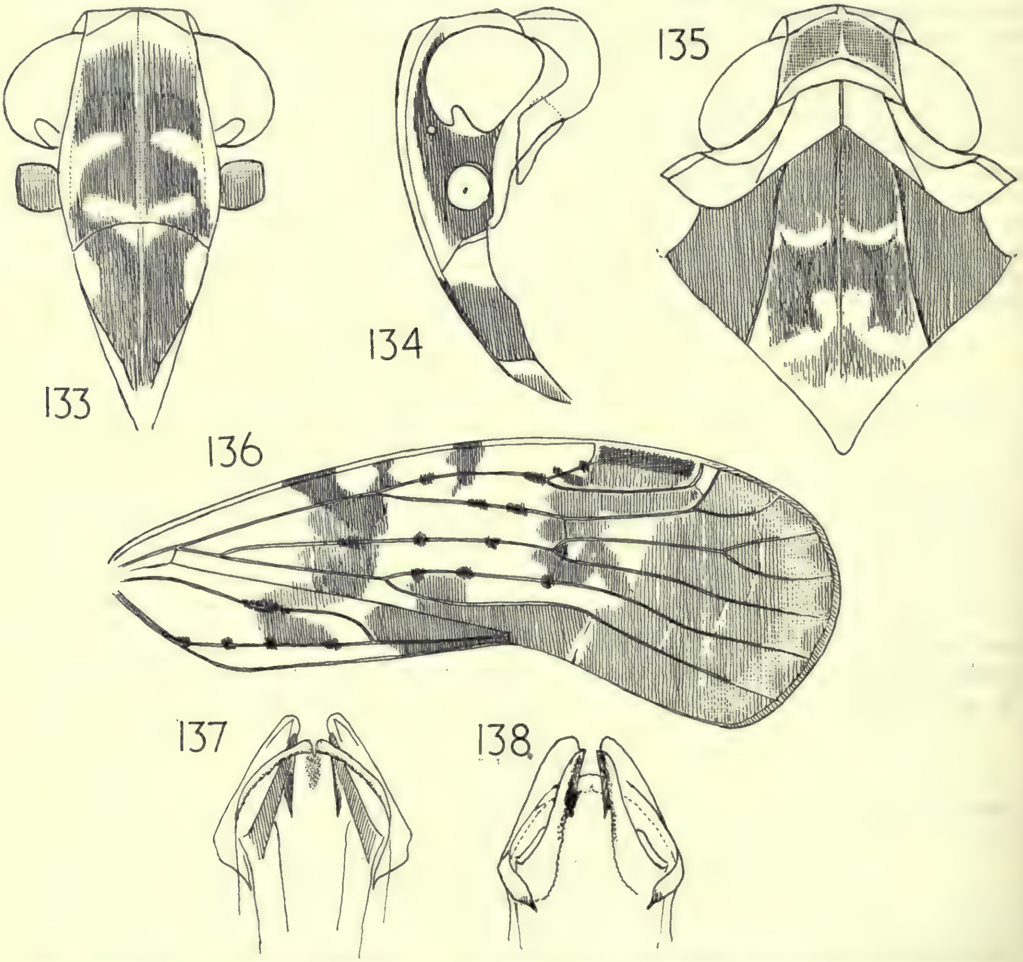
(*G. Kuschel*). There is one specimen in the Paris Museum labelled *Cixius ornatipennis* Bl., 15.43. This agrees with the original description and is here considered to be the type.

### ***Catonia gayi*** Spinola **comb. n.**

(Text-figs. 139–143)

*Cixius gayi* Spinola, 1852*a* : 248.
*Cixius maculatus* Blanchard, 1852*a* : 252. **syn. n.**
*Cixius valdiviensis* Blanchard, 1852*a* : 253. **syn. n.**
*Cixius irroratus* Blanchard, 1852*a* : 253. **syn. n.**

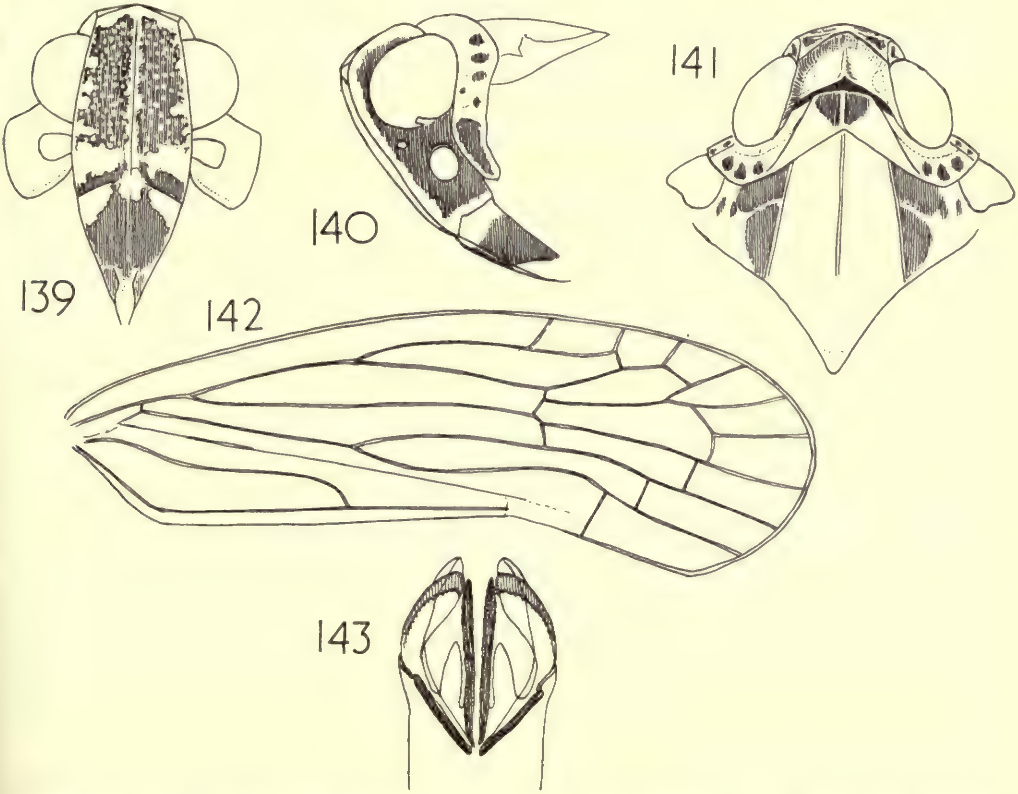
♂. Anal segment of male short, in profile with ventral margin convex in basal half, concave in distal half, in dorsal view almost semicircularly rounded, with apical margin feebly excavate at



FIGS. 133–138. *Catonia ornatipennis* (Blanchard). 133, Frons and clypeus; 134, head in profile; 135, vertex, pronotum and mesonotum; 136, tegmen; 137, aedeagus, ventral view; 138, aedeagus, dorsal view.

middle, anal style rather short, distinctly surpassing apical margin. Pygofer rather short, in lateral view with posterior margin almost straight, only very weakly convex, medioventral process not quite as broad as long, bifid in its distal half. Aedeagus with phallobase bilaterally symmetrical, each half produced distally into four unequal lobes, as follows : dorsally a ribbon-like lobe, denticulate on its dorsal margin, curved mesad apically to meet its counterpart in middle line ; below this a lanceolate-spatulate lobe, slightly hollowed, like a scoop ; mesad of this, and distinctly separated from it, a short, flattened thumb-like lobe directed caudad ; along the mesal margin of this lobe a vertical, narrow, subspatulate lobe extending caudad almost to apex, its surface minutely studded with denticles ; from the base of this lobe an oblique vertical flange extends across the ventral surface to the middle of the lateral margin ; phallic appendages long, strap-like, not quite similar at apex, inner surface minutely denticulate. Genital styles as figured, distal half of dorsal margin produced dorsad in a quadrate lobe with its distal angles acutely produced, a long rod-like process arising on inner surface near base, directed dorsad, ventral margin of styles scroll-like basally and incurved to meet in middle line.

CHILE : Isla Wellington, Puerto Edén, 7 ♂, 2 ♀, 13, 30.xi.58, under *Nothofagus nitida* (*G. Kuschel*) ; 40 ft., 6.xii.58, in *Nothofagus* forest (*M. W. Holdgate*) ; I. Chiloe, Chepu, 6 ♂, 16, 19.x.58 (*G. Kuschel*) ; Valdivia, El Mirador, 1,600 m., 2 ♀, 5.i.57 (*G. Kuschel*).



FIGS. 139–143. *Catonia gayi* (Spinola). 139, Frons and clypeus ; 140, head and thorax, lateral view ; 141, vertex, pronotum and mesonotum ; 142, tegmen ; 143, aedeagus, dorsal view.

The description given by Spinola refers primarily to a species with a frons speckled with yellow ; a form with " dos fajas transversales blancas en la frente " is referred to as a variety in a postscript to the description. The writer accordingly here restricts Spinola's specific concept to the species with a speckled frons, and, as a result, is led to make the synonymy given above. A figure purporting to be that of *Cixius gayi* Spin., is given in pl. 3 fig. 3 of the *Atlas Zoologico*, but in fact represents the much larger *Cixius chilensis* Spin., which belongs in the Dictyopharid genus *Chondrodera* Mel.

The writer has not seen the type of *Cixius gayi* Spin., and it was not traced in the Paris Museum. The three species here placed in synonymy with it are each represented in the Paris Museum by a single specimen, labelled, respectively, *Cixius maculatus* Bl. 15.43, *Cixius valdiviensis* Bl. 15.43, and *Cixius irroratus* Bl. 15.43. Each agrees with the original description and is considered to be the type.

## Family **DICTYOPHARIDAE**

### ***CHONDRODERA*** Melichar

*Chondrodera* Melichar, 1912*a* : 157. Orthotype, *Chondrodera granicollis* Melichar, 1912*a* : 217.
*Taractellus* Metcalf, 1948 : 77. Orthotype, *Cixius chilensis* Spinola. **syn. n.**

### ***Chondrodera chilensis*** (Spin.)

*Cixius chilensis* Spinola, 1852*a* : 249.

The figures given in Gay's *Atlas zoologico, Entomologia, Hemipteros*, pl. 3, figs. 3, 3*a–c*, refer to *C. chilensis*, and not to *Cixius gayi* Spin., as stated both in the Atlas and on p. 248 of the seventh volume of the *Historia de Chile*.

CHILE : Santiago, La Florida, 1 ♀, 28.iii.1956 (*G. Kuschel*).

### ***SICORIS*** Stål

*Sicoris* Stål, 1866*a* : 151. Orthotype, *Dictyophara gayi* Spinola, 1852*a* : 243.

This genus and *Sicorisia* Melichar may be separated as follows.

Frons carinate only submedially in basal half, and only medially in distal half, in profile distinctly concave ; eyes with a wide area behind, but no callus ; basal segment of post-tarsus with 22 teeth at apex, second segment with 16 teeth **SICORIS** Stål.

Frons tricarinate throughout, in profile straight ; eyes with a thick callus behind ; basal segment of post-tarsus with 14–16 teeth at apex, second segment with 14 teeth . . . . . . . . . . . . **SICORISIA** Melichar

### ***Sicoris gayi*** (Spinola)

*Sicoris gayi* Spinola, 1852*a* : 243.

♂. Anal segment of male about twice as long as broad, in profile shortly and abruptly deflexed at apex, apical margin truncate, apical angles not at all produced, anal foramen in apical quarter. Aedeagus in repose tubular, ensheathed in membranous folds, a pair of tubular membranous processes arising dorsally at apex directed cephalad above aedeagus, each tapering gradually into a slender spinose process ; a pair of short broad flattened blade-like pigmented processes arising at base of aedeagus lateroventrally, directed caudad. Genital styles rather less than twice as long as broad, in side view with lower margin shallowly convex, meeting apical margin subrectangulately, apical margin oblique, straight, as long as dorsal margin, dorsal margin straight, ascending to apical angle, which is produced in a short stout spine curved cephalad ; a stout blunt spine on outer surface just below dorsal margin at its middle.

CHILE : Santiago, Cuesta Zapata, 1 ♀, 30.xi.1947 (*G. Kuschel*) ; La Curro, 3 ♂, 27.i.51 (*J. Herrera G.*).

## ***SICORISIA*** Melichar

*Sicorisia* Melichar, 1912*a* : 161. Orthotype, *Sicorisia discreta* Melichar, 1912*a* : 161.

### ***Sicorisia discreta*** Melichar

*Sicorisia discreta* Melichar, 1912*a* : 161.

♀. Frons flat, tricarinate throughout, a moderately broad margin behind each eye, developed as a thick callus. Post-tibiae with four spines laterally, eight apically, basal post-tarsal segment with two simple teeth and twelve to fourteen scale-bearing teeth, second segment with two simple teeth and twelve scale-like teeth. Tegmina coelopterous, with $Cu_1$ three-branched, forking at about one-third from base. Wings about two-thirds as long as tegmina, narrow, strap-like.

CHILE : E. Peumo, 1 ♀, 17.xi.51 (*J. Herrera G.*), in U.S.N.M.

### ***Sicorisia breviceps*** **sp. n.**

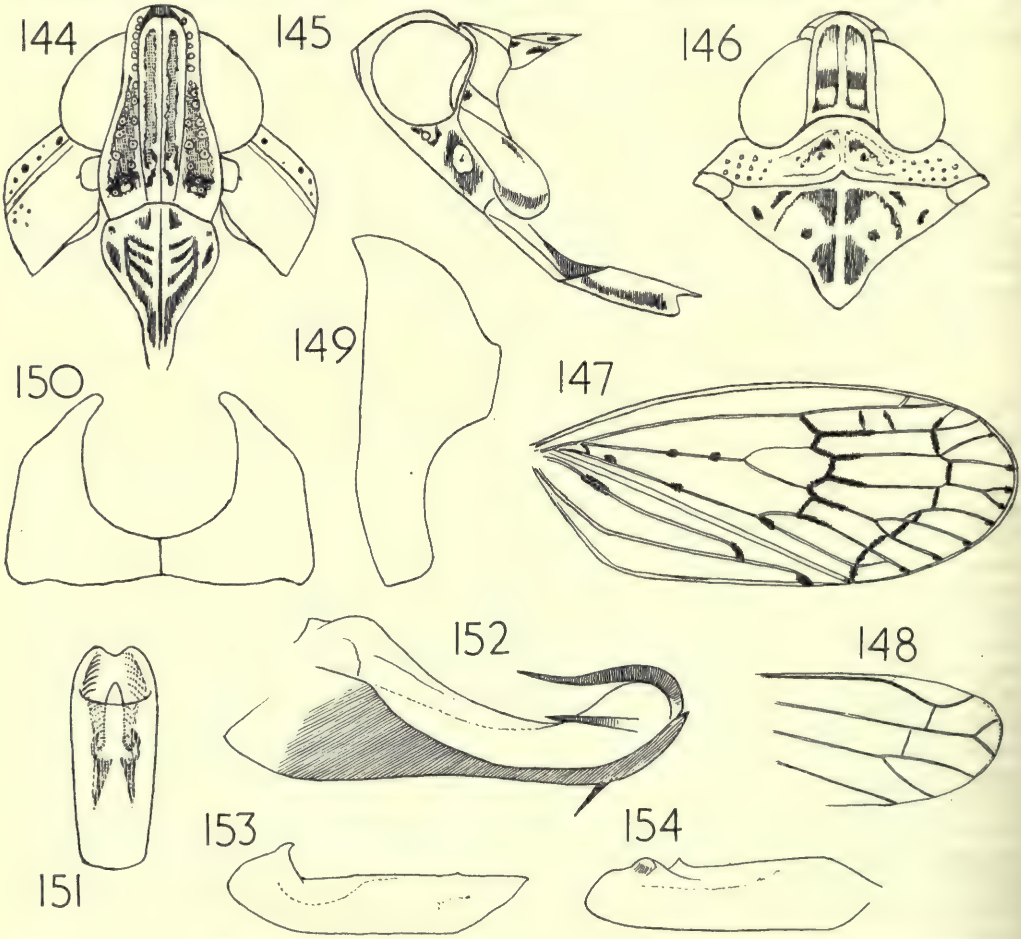
(Text-figs. 144–154)

♂. Vertex longer than broad at base (almost 1·4 : 1), basal margin weakly concave, lateral margins straight, slightly converging distad, apical margin convex, all margins carinate, including basal margin, median carina distinct throughout ; frons in middle line longer than broad (nearly 1·7 : 1), wider at apex than at base, lateral margins sinuate, disc tricarinate, in profile straight, except at base where it curves backward to vertex ; clypeus distinctly broader than frons, post-clypeal portion with lateral margins carinate, strongly convex, median carina distinct ; rostrum reaching beyond middle of abdomen, subapical segment longer than apical, and surpassing post-trochanters. Pronotum rather short, anterior margin of disc weakly convex, posterior very weakly concave, almost straight, median carina distinct, lateral carinae of disc feeble, closely following hind margin of eyes, two carinae on each side between eye and lower half of tegula, lateral lobes with ventral margin bent anteriorly, eyes round, bordered posteriorly by a callus, ocelli distinct, a short oblique carina across gena just below ocellus, antennae with first segment very short, second segment globose ; mesonotum broader than long, disc tricarinate, with lateral carinae curved mesad anteriorly to form a transverse carina, and strongly diverging basad. Legs slender, protibiae longer than profemora (about 1·2 : 1), post-tibiae with five teeth laterally, eight apically, basal metatarsal segment with two simple teeth and twelve small scale-bearing teeth, second metatarsal segment with two simple and twelve small scale-bearing teeth.

Tegmina coelopterous, longer than broad (about 2·2 : 1), deeply rounded apically, $Sc + R$ forked at level of union of common claval vein with margin, $M$ fork at middle of tegmen, $Cu_1$ forked slightly distad of $M$ fork, and with only two veins at apex ; common claval vein shorter than anterior claval vein. Wings not quite as long as tegmina, and about half as wide, $M$ and $Cu_1$ each forked once near apex.

Ochraceous ; carinae of frons and clypeus, and lateral carinae of vertex, intercarinal areas of frons and clypeus interruptedly, and of vertex and mesonotum at base and apex, lateral lobes of pronotum and pleura except at margins, more or less dilute fuscous ; a transverse band across vertex, genae near antennae, punctation on pronotal disc, four spots on mesonotum, one in each compartment, and longitudinal stripes on all legs, and apical segment of pro- and mesotarsi, piceous. Tegmina translucent, two ovate spots on *M* and one on $Cu_1$, and all cross-veins, fuscous piceous. Wings milky hyaline, veins brown.

Anal segment of male in dorsal view longer than broad (about 2·5 : 1), lateral margins parallel, apical margin slightly incised at middle. Pygofer moderately short, dorsolateral angles moderately produced caudad in a rounded-truncate lobe, weakly inflected distally. Aedeagus tubular, almost porrect, with a pair of moderately short spinose processes ventrally three-quarters from base, a pair of moderately short spinose processes laterally a little before apex, and a pair of



FIGS. 144–154. *Sicorisia breviceps* sp. n. 144, Frons and clypeus ; 145, head in profile ; 146, vertex, pronotum and mesonotum ; 147, tegmen ; 148, apex of wing ; 149, pygofer, lateral view ; 150, pygofer, dorsal view ; 151, anal segment, dorsal view ; 152, aedeagus, left side ; 153, right genital style, ventral view ; 154, left genital style, lateral view of mesal surface.

longer spinose processes arising at apex, directed cephalad above aedeagus. Genital styles relatively long and narrow, dorsal and ventral margins parallel for much of their length, apical angle produced dorsad in a short spinose process, and a short acute lobe directed mesad on inner surface of style.

♂. (coleopterous) : length, 3·9 mm. ; tegmen 3·0 mm.

Holotype ♂. CHILE : V. Marga Marga, in B.M. (N.H.).

This species differs from *S. discreta* in the much shorter vertex, the degree of curvature of the frontal margins, the shape of the tegmina and wings and in the venation of the former.

## *MYROPHENGES* gen. n.

Type-species, *Issus planifrons* Spinola, 1852.

Head with eyes much narrower than pronotum. Vertex about twice as broad as long, anterior margin convex, lateral margins straight, slightly diverging basad, basal margin shallowly concave, median carina distinct, obsolete distally, disc shallowly depressed, base of frons amply visible from above, more shallowly convex than anterior margin of vertex ; frons about as long as broad, disc shallowly convex basally, less so apically, basal margin, as visible in anterior view, transverse or shallowly convex, lateral margins diverging to below level of antennae, thence rather strongly incurved to frontoclypeal suture, disc rugose punctate, with median carina absent basally, broad and only feebly indicated distally ; clypeus about as long as broad at base, ecarinate, mandibular sclerites amply visible in anterior view ; rostrum surpassing mesotrochanters, scarcely attaining post-trochanters, apical segment about two-thirds of length of subapical ; antennae short, basal segment ring-like, scarcely visible, second segment subglobose ; ocelli relatively large, eyes rounded, not or little excavated beneath. Pronotum about as long as vertex, median disc about twice as broad as long, tricarinate, a carina on each side between eye and basal cell in tegmen, a stouter carina on each side below this, between eye and tegula ; mesonotum broader than long, disc flat, lateral carinae distinct, median carina absent ; legs rather short, profemora and mesofemora a little compressed laterally, post-tibiae with three spines laterally, one large and five smaller spines apically, basal metatarsal segment with seven small even teeth apically, second segment with six teeth, one larger than the others. Third, fourth and fifth abdominal terga each with two transverse rows of pores.

Tegmina subcoriaceous, little surpassing abdomen and decurved distally, $Sc + R$ forked near base, each of these veins simple to apex, $M$ forked near apex, $Cu_1$ forked at level of union of claval veins, two rows of transverse veinlets present ; claval suture distinct, claval veins uniting at three-quarters from base, common vein entering apex of clavus. Wings as long as tegmina, all veins simple.

Anal segment of male short. Pygofer short, distal margin transverse, united with convolute genital styles.

The generic concept is based on the specimen in the British Museum here figured, which is believed to represent the species cited. It stands far apart from all others. In the form of the vertex it can be compared only with *Taosa*, *Brachytaosa* and *Cladypha*. In the first two, a scale is attached to each of the teeth of the distal margin of the post-tarsal segments, a structure absent in the present genus, whereas in *Cladypha*, with which it agrees better in head structure, a pad of setae is developed on the first and second post-tarsal segments, and in the tegmen, a cross vein is present in the clavus, structures, again, not found in *Myrophenges*. Moreover, in *Cladypha* the head is distinctly wider than the pronotum.

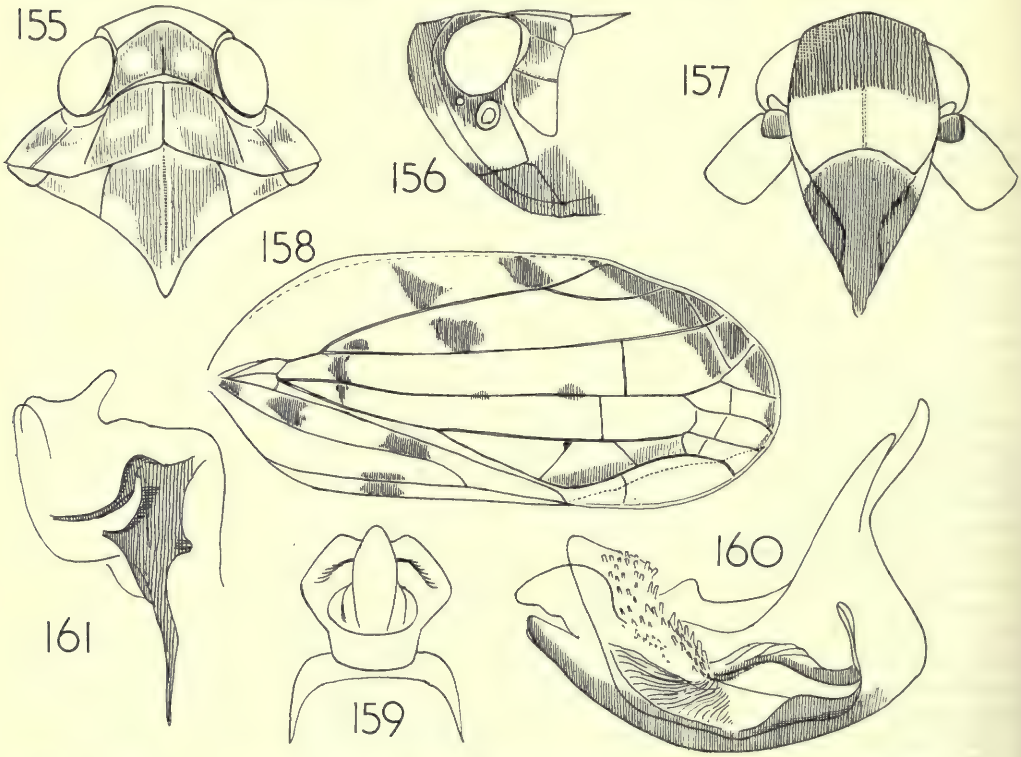
### *Myrophenges planifrons* (Spinola) **comb. n.**

(Text-figs. 155–161)

*Issus planifrons* Spinola, 1852*a* : 265.

♂. Anal segment of male in dorsal view about as broad as long. Pygofer moderately long. Aedeagus comprising a deep narrow trough, with its dorsal margins not symmetrical on each side; within this trough a subtubular membranous process, upcurved distally, and fimbriate on dorsal surface in distal half. Genital styles relatively broad, with apical angle produced in a stout finger-like lobe; a broad lobe arising on inner surface of style in basal half, produced cephalad and tapering.

S. CHILE: 1 ♂, Llanquihue (*F. M. Edwards*), B.M. 1927–63.



FIGS. 155–161. *Myrophenges planifrons* (Spinola). 155, Vertex, pronotum and mesonotum; 156, head in profile; 157, frons and clypeus; 158, tegmen; 159, anal segment of male; 160, aedeagus, left side.

## Family **ISSIDAE**

### ***NOTOSIMUS* gen. n.**

Type-species, *Conosimus angustipennis* Melichar, 1906.

Vertex rather broader between eyes than long in middle (less than 1·3 : 1), approximately pentagonal with anterior margin obtusely angulate at middle, lateral margins straight and posterior margin shallowly excavate, disc flat or feebly depressed, feebly carinate medially; frons with greatest length subequal to greatest width, in ventro-anterior view with basal margin convex, lateral margins convex, frontoclypeal suture deeply concave, frons tricarinate; clypeus subequal to greatest length of frons, medially elevated but not carinate; rostrum reaching to post-trochanters; subapical segment shorter than apical; antennae with basal segment short, ring-like, second segment longer than broad, cylindrical, widening distally, obliquely truncate at apex, ocelli absent, eyes round, rather weakly emarginate below. Pronotum in middle line more than half as long as vertex, anterior margin strongly convex, posterior margin weakly concave, disc ecarinate except for a feeble median carina, a short coarse carina at each lateral margin; mesonotum rather broader than long, disc tricarinate with lateral carinae concave; tegulae present, largely concealed; post-tibiae with two spines laterally, about seven apically, basal metatarsal segment with about six spines. Tegmina longer than broad (more than 2 : 1) broadest near base, narrowest distally, costa strongly convex in basal quarter, weakly sinuately concave in distal half, apical angle acutely rounded, anal angle obtusely rounded, apical margin oblique, weakly convex, $Sc + R$, and $M$ simple, $Cu_1$ forked at middle, claval suture extending to apical quarter of tegmen. Wings not quite as long as tegmina.

Anal segment of male moderately long, weakly deflexed in apical half, with sides deeply impressed. Pygofer rather short, dorsolateral angles moderately produced caudad, deeply rounded. Aedeagus complex, almost as deep dorsoventrally as long. Genital styles each triangular in side view, united mesally along their ventral margin.

Although the subfamilial affinity of this curious species cannot be determined with absolute certainty until the female genitalia can be examined, it is confidently regarded as a member of the Acanaloniinae, and in the writer's key to this subfamily (Fennah, 1954 : 472), if the presence of the lateral pronotal carina is ignored, it runs to couplet (3) (4), and differs from *Galapagosana* and *Euthiscia* in the claval suture not reaching to the apical margin, and from *Thiscia* and *Acanalonia* in the tegmina being widest much basad of the middle.

From *Conosimus*, to which the species was referred by Melichar, it differs in the relatively much broader frons, in the strongly concave frontoclypeal suture, the carination of the mesonotum and the presence of well-developed wings.

The opportunity is here taken of recording that the references to the second post-tarsal segment in couplet (5) (6) of the key cited above, and on the page following the key, should have been to the first post-tarsal segment.

### *Notosimus angustipennis* (Melichar) **comb. n.**

(Text-figs. 162–170)

*Conosimus angustipennis* Melichar, 1906 : 109.

♂. Anal segment of male relatively narrow, shallowly decurved distally, a deep groove along each side distad of middle. Pygofer rather short, dorsolateral angles roundly produced caudad, lateral margin sinuate, shallowly excavate near middle. Aedeagus complex, phallobase tubular, much shorter than deep dorsoventrally; dorsal margin produced caudad medially in a finger-like lobe (Text-fig. 169,*a*), laterally a pair of dorsolateral lobes (*b*), two pairs of submedian spinose processes, one arising on inner surface of phallobase (*c*), the other marginally (*d*); ventrally an unpaired lobe narrowly produced dorsad at apex (*e*) and with a pair of vertical processes subapically (*f*); a pair of long taeniate processes arising dorsally, curving ventrocephalad (*g*).

Genital styles triangular, with dorsal and ventral margins almost straight, apical angle produced dorsad in a short blunt lobe, apical margin shallowly sinuate, produced at middle in a small acute process; ventral margin slightly invaginated before apex.

ARGENTINE : La Rioja Prov., Patquia, 1 ♂, i.1933 (*K. J. Hayward*), B.M. 1933–333.

## *PLAGIOPSIS* Berg

*Plagiopsis* Berg, 1883 : 189. Haplotype, *Plagiopsis distanti* Berg, 1883 : 191.

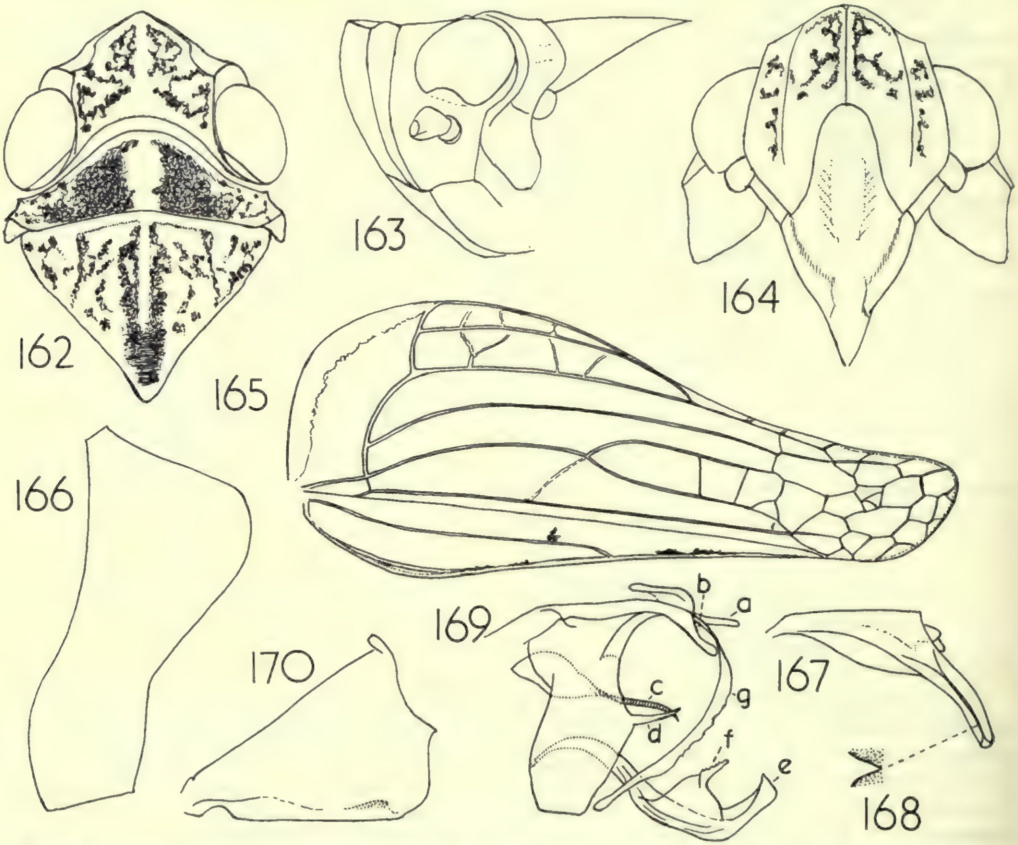
### *Plagiopsis scotti* Breddin

(Text-fig. 171–175)

*Plagiopsis scotti* Breddin, 1897*a* : 17.

♀. Post-tibiae with one spine laterally, six apically, basal and second metatarsal segments each with two spines.

Anal segment of female and posterior margin of seventh (pregenital) sternite of female as figured.



FIGS. 162–170. *Notosimus angustipennis* (Melichar). 162, Vertex, pronotum and mesonotum ; 163, head and thorax, lateral view ; 164, frons and clypeus ; 165, tegmen ; 166, pygofer lateral view ; 167, anal segment, lateral view ; 168, section of groove along lateral margin of anal segment (diagrammatic) ; 169, adeagus, left side (for lettering see text) ; 170, left genital style, lateral view.

Argentina: Chaco, 1 ♀, 29.x–11.xi.1953 (*K. J. Hayward*), B.M. 1934–519.

### ***Plagiopsis bergi*** Breddin

(Text-figs. 176–180)

*Plagiopsis bergi* Breddin, 1897*a* : 18.

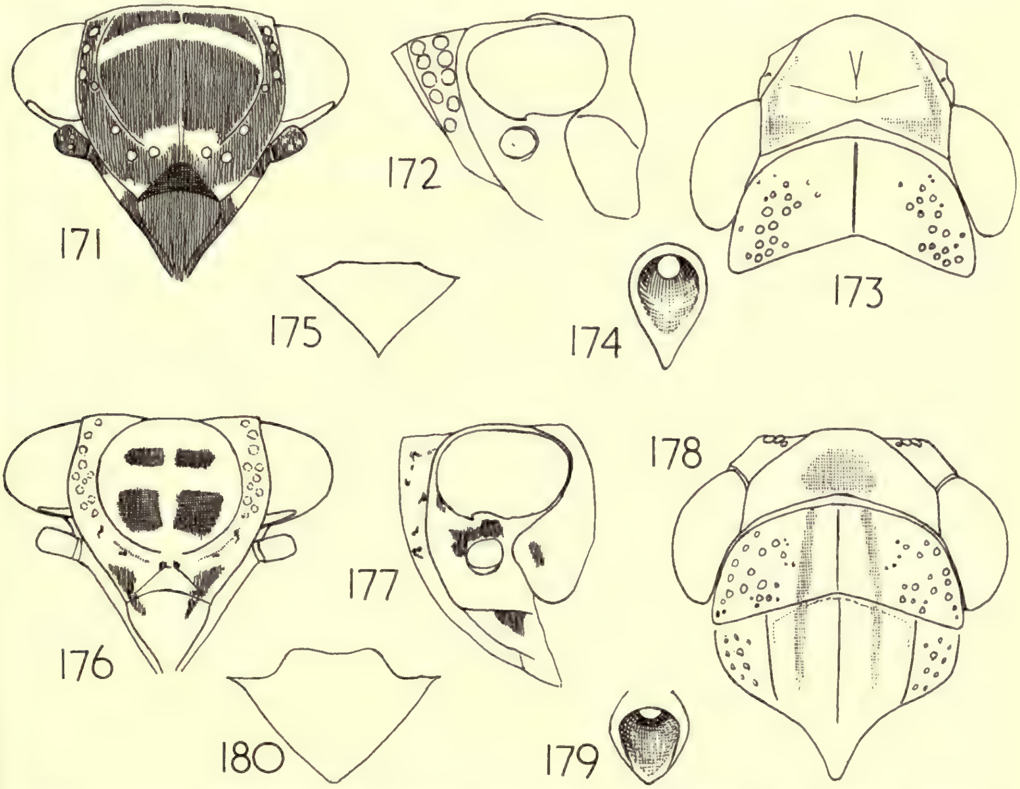
♀. Anal segment of female and posterior margin of seventy (pregenital) sternite of female as figured.

Argentina: Chaco, Roque Saen, Peña, 1 ♀, 1932 (*K. J. Hayward*), B.M. 1933–58.

### ***SARNUS*** Stål

*Sarnus* Stål, 1866*a* : 204. Logotype, *Issus decipiens* Spinola, 1852 : 264.

Post-tibiae with two spines laterally, eight apically, basal metatarsal segment with nine spines, second segment with two. Wings reduced to small lobes.



Figs. 171–180. *Plagiopsis scotti* Breddin. 171, Frons and clypeus ; 172, head in profile ; 173, vertex and pronotum ; 174, anal segment of female, posterior view ; 175, seventh sternite of female, ventral view, posterior margin uppermost. *Plagiopsis bergi* Breddin. 176, Frons and clypeus ; 177, head in profile ; 178, head, pronotum and mesonotum ; 179, anal segment of female, posterior view ; 180, seventh sternite of female, ventral view ; posterior margin uppermost.

Three species before the writer do not agree with a specimen labelled *Issus decipiens* Spin. from Chile in the Paris Museum. The last has a frons rather distinctly widening distally, and with the basal two thirds of the disc (except submarginally) very dark fuscous, almost black, with the short portion of the incomplete median carina stramineous, and the apical third of the disc pale. The three species may be separated as follows.

1 Tegmina with apical margin oblique, almost straight, apical angle subacutely rounded. Anal segment of female three times as long as broad at widest part **rhomboidalis** (p. 269)

– Tegmina with apical margin rounded and broadly rounding into costal margin without any evident apical angle. Anal segment of female not more than twice as long as broad at widest part . . . . . . . . . . 2

2 Lateral margins of frons shallowly arcuate. Ground colour of body and tegmina stramineous, little sprinkled with piceous. . . . . . . **gilvus** (p. 270)

– Lateral margins of frons straight. Colour of body and tegmina stramineous or testaceous, heavily marked with castaneous-fuscous . . **rectemarginatus** (p. 268)

## *Sarnus rectemarginatus* sp. n.

(Text-figs. 181, 182, 190–194)

♂ ♀. Vertex broader than long in middle line (about 4·6 : 1), frons in middle line longer than broad (more than 1·2 : 1), wider at base than at apex (1·5 : 1), lateral margins very shallowly sinuate, almost straight to distal fifth, thence incurved to frontoclypeal suture, median carina distinct in basal half, obscurely present in distal half. Tegmina with apical margin convex, broadly rounding into costal margin.

Stramineous, but so heavily sprinkled castaneous-piceous, in the same basic pattern as in *S. gilvus*, that the total area, occupied by each hue are about equal. Tegmina minutely and densely sprinkled fuscous on a testaceous ground ; an irregular curved band from costa to $Cu_2$ at middle, and from this point to $Cu_1$ at apex, almost piceous ; longitudinal veins castaneous, veinlets stramineous, those at apical margin sometimes with a greenish tinge.

♂. Anal segment of male moderately long, distally deflexed, apical margin truncate, in lateral view with lower margin not produced ventrad in a lobe at apex. Aedeagus tubular, U-shaped, a pair of long spinose processes arising laterally near middle, curved ventrad then cephalad, each process tapering distally, distinctly but not abruptly more rapidly narrowing a little before apex. Genital styles as figured.

♀. Anal segment of female in dorsal view sub-rhomboidal, twice as long as broad, lateral margins distad of level of anal style almost straight, converging to broadly rounded apical margin ; margins moderately decurved ventrad.

♂. length, 3·7 mm. ; tegmen, 3·4 mm.
♀, length, 4·0 mm. ; tegmen, 4·0 mm.

Holotype ♂. CHILE : Coquimbo, El Panque, 1,400 m., 14.x.1957 (*G. Kuschel*).

Paratypes : 1 ♂ 2 ♀, same data.

This species is recognisable by the characters given in the key. Of the distinctive features, the near parallellity of the lateral margins of the frons is perhaps the most easily observed.

## ***Sarnus rhomboidalis*** **sp. n.**

(Text-figs. 183–189)

♂ ♀. Vertex broader than long in middle line (6 : 1) ; frons almost as broad as long in middle line ; lateral margins weakly diverging in basal two-thirds ; median carina present only in second quarter from base. Tegmina with apical margin almost straight, oblique, subacutely and rather abruptly rounding into costal margin.

Fuscous ; discs of frons, pronotum and mesonotum densely speckled testaceous, carinae of pronotum and mesonotum, margins of legs and pleurites, testaceous-ochraceous. Tegmina translucent, fuscous ; veins castaneous, veinlets testaceous to stramineous, a subovoid area between $Sc + R$ and $Cu_1$ at level of $Sc + R$ fork, stramineous.

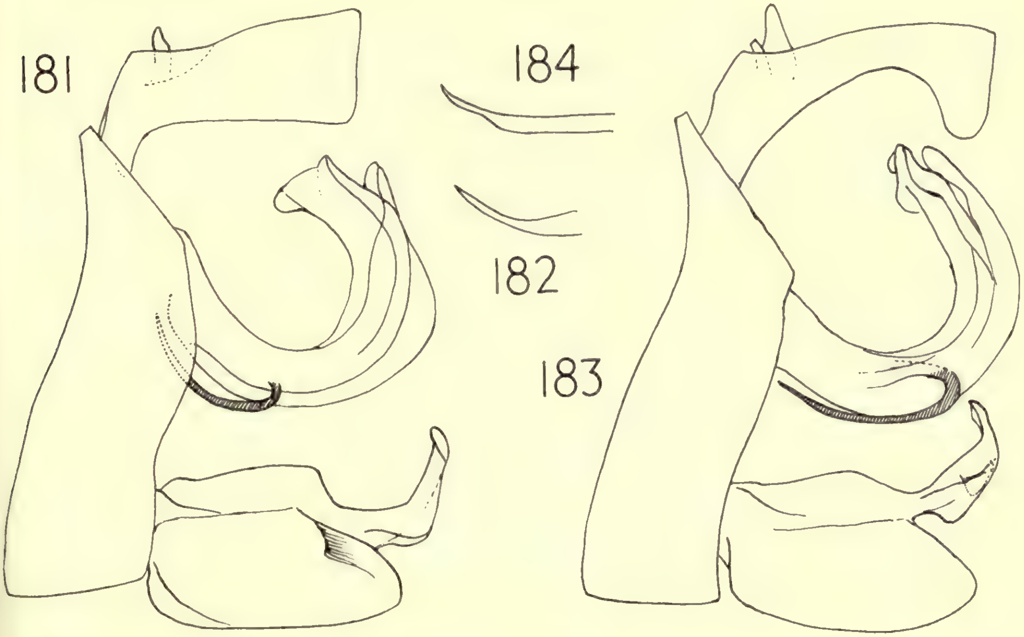
♂. Anal segment of male moderately long, distally deflexed, in lateral view narrow ; lower margins strongly produced ventrad in apical quarter in a bluntly rounded lobe. Pygofer rather short. Aedeagus tubular, U-shaped, a pair of spinose processes arising laterally near middle, directed ventrad then cephalad, each process abruptly narrowing a little before apex. Genital styles as figured.

♀. Anal segment of female long, fully three times as long as broad at widest part, lateral margins distad of anal foramen almost straight, moderately converging distad, apical margin deeply rounded.

♂ : length, 3·5 mm. ; tegmen, 3·6 mm.
♀ : length, 3·8 mm. ; tegmen, 4·5 mm.

Holotype ♂. CHILE : Cuesta Zapata, Santiago, 30.xi.1947 (*G. Kuschel*).

Paratypes : 1 ♂, 4 ♀, same data.



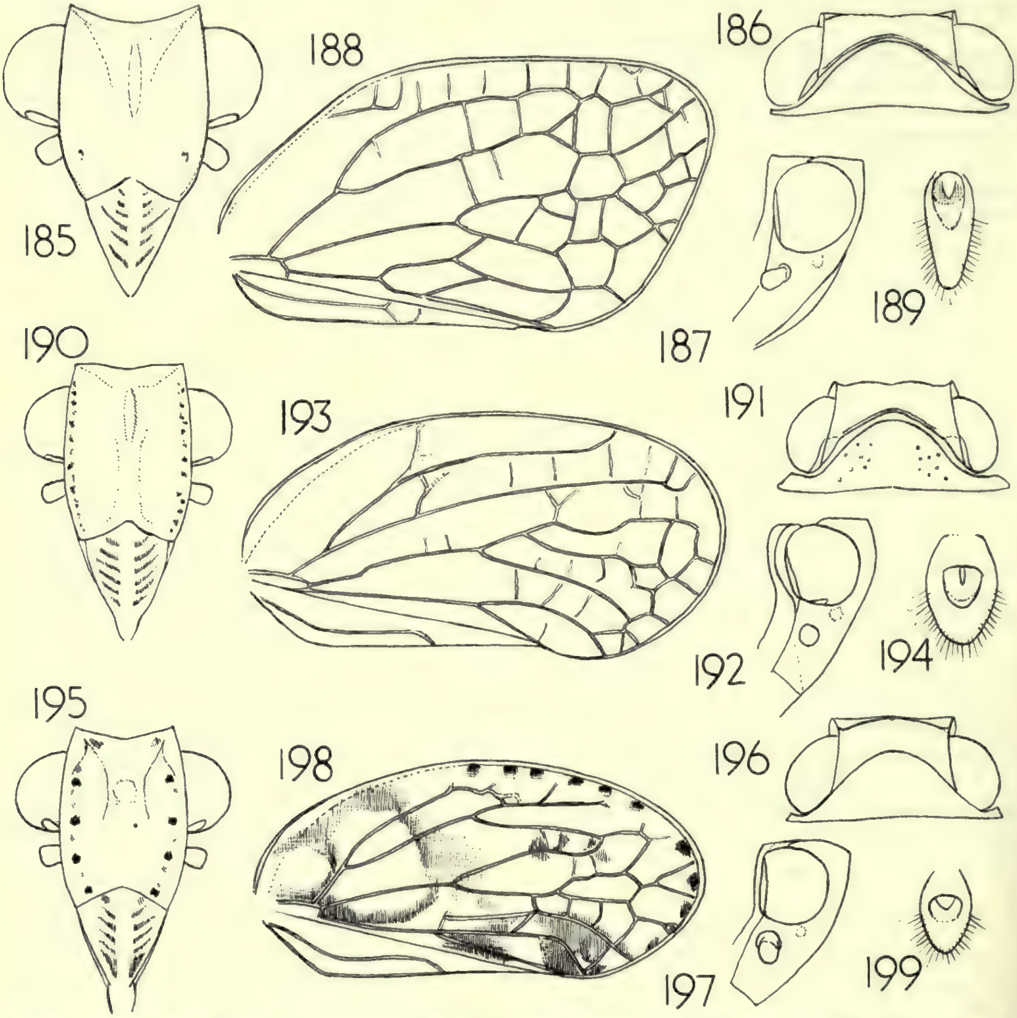
FIGS. 181–184. *Sarnus rectemarginatus* sp. n. 181, Male genitalia ; 182, apical portion of ventrolateral processes of aedeagus. *Sarnus rhomboidalis* sp. n. 183, Male genitalia ; 184, apical portion of ventrolateral processes of aedeagus.

This species is distinguished by the characters given in the key above, and by the structure of the male genitalia.

### *Sarnus gilvus* sp. n.

(Text-figs. 195–199)

♀. Vertex broader than long in middle line (4·7 : 1), frons in middle line longer than broad (1·1 : 1), slightly wider at base than at apex, lateral margins weakly convex, median carina more or less distinct on basal half of frons. Tegmina with apical margin convex, broadly rounding into costal margin.



FIGS. 185–199. *Sarnus rhomboidalis* sp. n. 185, Frons and clypeus; 186, vertex and pronotum; 187, head in profile; 188, tegmen; 189, anal segment of female, posterior view; *Sarnus rectemarginatus* sp. n. 190, Frons and clypeus; 191, vertex and pronotum; 192, head in profile; 193, tegmen; 194, anal segment of female, posterior view; *Sarnus gilvus* sp. n. 195, Frons and clypeus; 196, vertex and pronotum; 197, head in profile; 198, tegmen; 199, anal segment of female, posterior view.

Stramineous ; a row of four to eleven small spots on each side of frontal disc submarginally. a sprinkling of spots distally at middle and basally at lateral angles, two rows of small spots in anterior half of pronotum, and a round spot on each side of median carina at base, lateral lobes sometimes, a linear mark on each side of median carina of mesonotum, two linear markings on each side of clypeus, rostrum apically, two diffuse transverse bands on pro- and mesofemora, one on pro- and mesotibiae, fourth to sixth abdominal terga, except medially, and about six small spots on each corresponding ventrite, piceous. Tegmina translucent, stramineous, a series of about ten sublinear spots along costal margin and a small spot in each apical areole, a diffuse broad band from costa at one third from base to clavus at apex, and longitudinal veins in their middle portion, dark fuscous ; veins in an ovate area in basal third of corium, and in clavus, concolorous with ground.

Anal segment of female in dorsal view ovate, less than twice as long as broad, lateral margins distad of level of anal style convex, decurved ventrad.

♀ : length, 3·0 mm. ; tegmen, 4·0 mm.

Holotype ♀. CHILE : Carrizal Bajo, playa, 10.x.1957.

Paratype : 1 ♀, same data.

In the type specimen the lateral lobes of the pronotum are pale ; in the more heavily marked paratype they are mostly piceous. This species is distinguished by its general pale ground colour, and by the evenly arcuate shape of the lateral margins of the frons.

## *NUBITHIA* Stål

*Nubithia* Stål, 1859*a*: 323. Haplotype, *Nubithia grisescens* Stål, 1859*a* : 323.

### ***Nubithia gayi*** (Spinola) **comb. n.**

*Issus gayi* Spinola, 1852*a* : 263.

It is possible that *N. chilensis* Melichar (1906 : 177) will prove to be the same as this species, but until the types can be examined the relationship cannot be decided with certainty.

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# THE EMBIOPTERA OF EUROPE AND THE MEDITERRANEAN REGION

E. S. ROSS

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BY

E. S. ROSS

California Academy of Sciences, San Francisco

*Pp.* 273–326 ; 20 *Text-figures*

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# THE EMBIOPTERA OF EUROPE AND THE MEDITERRANEAN REGION

*By* E. S. ROSS

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## SYNOPSIS

Twenty-four Recent and Tertiary species of Embioptera of the European and Mediterranean regions are recognized and revised. Nine of these are new species of *Embia*. One old species of *Embia* is placed in synonymy. The treatments of known species usually are based on holotypes, or other type specimens. The reference list is intended to include all papers on the systematics and biology of Embioptera occurring within the geographic scope of this work.

## INTRODUCTION

EXCEPT for the recent work of Dr. Renzo Stefani of Sardinia, no great effort has been made to collect or study the Embioptera in the regions here considered. The writer is monographing the order but his extensive fieldwork to gather adequate study material has been confined to the major evolutionary centres of the order—the Old and New World tropics and Australia. Consequently, the present study can be considered little more than a consolidation of information based on a review of the literature and the few available specimens scattered in museums, chiefly in Europe. It is hoped that this comprehensive coverage will encourage resident workers in the Mediterranean region to develop an interest in the order and at least to make adequate collections.

### *Collecting Methods*

No sample of Embioptera is of much value unless it includes at least one adult male. Such specimens exhibit the principal characters used in classification and species identification. Adult females, although identifiable within a limited region, are only of secondary value. Unfortunately, adult males of most species mature during a limited season and die soon after mating. During the greater part of the year the colonies comprise aggregations of adult females and their broods of nymphs. In the Mediterranean region even these are most likely to be encountered during the winter and spring rainy season. With increasing aridity and heat of summer and fall, most embiids confine their activity to the depths of the soil and must be collected by tedious excavation.

Therefore, the best way to obtain adult males is to collect nymphs alive and rear them to maturity in laboratory cultures. If not diseased, such cultures can be maintained indefinitely and will yield large series of adults for variation studies as well as for distribution to museums.

Fortunately, embiids are about the easiest insects to culture. The collector should go into the field with a digging tool, such as a geological pick, tweezers, vials of alcohol, and a number of large glass or plastic shell vials (about 1 in. × 5 in., with straight sides) with tight cotton stoppers.

In the Mediterranean climatic zone most embiid colonies will be found under stones in places with at least vestiges of native vegetation. In spring or early summer, adult males may be found in the field and killed and preserved in vials of alcohol. The other occupants of the colony should be taken alive. First pack a culture tube with habitat material, such as dead oak leaves, dry grass, or bark fragments, before introducing the insects. These are best caught by trapping them in a section of silk gallery which can be then transferred to the tube. Embiids also can be caused to run backwards into the tube and this reduces the hazard of injury with the pinch of tweezers.

The tube culture will support at least a dozen embiids but more can be collected if the larger field lot is soon established in a larger container, such as a jar.

Immediately after capture, the embiids will begin to spin new galleries in the habitat material which also serves as food. Periodically drops of water should be pipetted into the container to maintain slight dampness. After the culture becomes thoroughly webbed, and somewhat crowded, it is advisable to supplement the diet with lettuce leaf laid on the silk surface beneath the stopper. About every third day the old, uneaten leaf should be removed and replaced with fresh.

Maturing males tend to rest in upper galleries where they can be trapped and collected. If the original field lot was small, the first males should not be removed until it is reasonably certain mating has occurred. As a culture flourishes, one can afford to collect associated adult females, eggs, and nymphs. It should be noted that some species may be parthenogenetic. *Haploembia solieri* (Rambur) reproduces exclusively by parthenogenesis on islands in the Tyrrhenian Sea.

The culturing activity often also yields specimens of various parasites associated with embiids. Some cultures may fail due to pathological agents, notably infestation with sporozoan parasites of the genus *Diplocystis*.

## *General Biology*

The habitat and biology of Mediterranean embiids may be expected to be quite similar regardless of their systematics. The prime governing factor is the highly seasonal climate with a prolonged summer dry season which tends to restrict the occurrence to soil levels. Colonies are most readily encountered under objects on the ground, such as stones, logs, dry cattle droppings, etc. The silk galleries ramify amongst vegetative debris under and around such objects and, as the soil cracks with increasing desiccation, the galleries extend down these openings to cooler, damper depths. It is probable that some species come up from these levels at night in the dry season to feed. At such times they may carry back bits of leaf for consumption in the subterranean retreat.

Sexual maturity probably occurs once a year in the spring or early summer. The males mate and soon die. Their mandibles are used as clasping organs in mating and not for ingestion of food (the gut of adult males is devoid of food). The nymphs and parent females retreat to soil depths during the dry season but return to the surface with the first winter rains. In regions experiencing cold winter periods, the embiids rest completely enclosed in cocoon-like chambers in the galleries. They break out and resume activity during intermittent warm winter periods. *Oligotoma nigra* Hagen, occurring in the south-eastern portion of the Mediterranean region, may not have a fixed annual cycle and any stage or sex may be present at any time of the year.

Details on the biology of Mediterranean embiids may be found in papers by the following authors: Delamare Deboutteville (1946, 1949), Denis (1949), Friederichs (1906, 1923, 1934), Kusnezov (1904), Ledoux (1958), Lucas (1859), Michieli (1956, 1958), Stefani (1953, *et seq.*), Taborsky (1938).

## *Zoogeographic Considerations*

Embioptera essentially are tropical insects and the regions here considered represent the northern and western margins of the Ethiopian and Asian embiid faunas, respectively. The Baltic Amber fossil *Electroembia antiqua* (Pictet) shows that the order ranged into northern Europe during the early Tertiary. Today the most northern limits are in the Crimea, the Bulgarian littoral and European shores of the Mediterranean Sea. In more southern latitudes of Europe, such as Spain, and North Africa, the order ranges well inland and to higher altitudes.

Collecting to date, especially in eastern Mediterranean regions, has been neglected and we have little basis for meaningful zoogeographic conclusions. Also, caution must be exercised because embiids are easily transported in human commerce and species have been moved about during thousands of years of ancient commerce. It is possible for a given area to have been populated as a result of a single introduction and centuries of inbreeding of the limited gene pool conceivably could produce a population somewhat distinct from any other (as in island introductions).

*Oligotoma nigra* Hagen, a member of a species-group centred in northern India, apparently has been moved westward (perhaps beginning in early caravan traffic) and is now well established along the south-eastern Mediterranean littoral and up the Nile valley into Sudan. *Embia savignyi* Westwood of the Nile region appears to have been artificially carried to Crete and possibly other areas.

Except for the above species, the Embioptera of the Mediterranean area are native to the region, yet subject to artificial movement within this range. *Haploembia*

Verhoeff, of the otherwise Oriental–Indo-Australian family Oligotomidae, is the only genus restricted to the Mediterranean region and must have been derived from Asiatic stock (there are no endemic oligotomids in Africa). *Embia* Westwood is the best represented genus in the area and its Mediterranean species comprise a distinct, detached segment of the Ethiopian fauna in which the genus is an important element. It would appear that the *Embia* fauna moved into the region from the western side of Africa inasmuch as all of the endemic species are concentrated in the western Mediterranean and none have been collected around the eastern extremity of the Sea. This, however, may reflect a lack of collecting.

In the Middle East the genus *Embia* is replaced by *Parembia* Davis, a genus centred in north-western India and Pakistan (West).

## ACKNOWLEDGMENTS

This paper is a unit of a world scope monographic treatment of the Embioptera supported by research grants from the National Science Foundation and the National Geographic Society, both of Washington D.C. An introductory volume dealing with general topics and a world classification of genera is in preparation, as well as a series of larger volumes dealing with the species of the Ethiopian, Asian, Australian and New World faunas.

Part of the present study was conducted in several museums of Europe and this was followed by research on specimens borrowed from the institutions listed below. The writer is grateful to the named individuals for their cooperation and assistance.

Austria : Naturhistorische Museum, Wien (M. Beier). Belgium : Institut Royal des Sciences Naturelles de Belgique, Bruxelles (H. Synave). Denmark : Universitetets Zoologiske Museum, København (A. Nielsen, S. S. Tuxen). England : (B.M.N.H.) British Museum (N.H.), London (D. E. Kimmins). France : Laboratoire Arago, Bayuls-sur-Mer (C. Delamare Deboutteville) ; Museum National d'Histoire Naturelle, Paris (S. Kelner, J. Carayon). Germany : Deutsches Entomologisches Institut, Berlin (W. Hennig) ; Humboldt-Universitat zu Berlin (St. Von Keler) ; Geologischen Staatsinstitut in Hamburg (E. Voigt, W. Häntzschel) ; Staatliches Museum für Naturkunde in Stuttgart (W. Richter). Hungary : Magyar Nemzeti Muzeum, Budapest (Z. Kaszab). Italy : Museo Civico di Storia Naturale " G. Doria ", Genova (F. Capra) ; Universita di Cagliari, Sardinia (R. Stefani). Poland : Polska Akademia Nauk, Warszawa (J. Nast). Portugal : Lisboa (E. Luna de Carvalho). Spain : Museo de Zoologia, Barcelona (F. Español) ; Instituto Español de Entomologia, Madrid (G. Ceballos) ; Colegio del Salvador, Zaragoza (R. P. L. Palazon de Lattre, S. J.). Sweden : Zoologiska Institution Lund (P. Brinck). Switzerland : Naturhistorisches Museum, Basel (E. Sutter). United States : (M.C.Z.) Museum of Comparative Zoology, Cambridge, Mass. (P. J. Darlington) ; (C.A.S.) California Academy of Sciences, San Francisco (Author's collection).

## GENERAL EXPLANATION OF FIGURES

The figures in this paper were drawn by the author and are based on tracings of photomicrographs of cleared slide preparations. The various figures are seldom drawn to the same scale. An attempt has been made to show degree of sclerotization by line thickness and shading. Membranous areas are stippled. The basitarsal chaetotaxy and peg-like microsetae (echinulations) are accurately represented, otherwise setae generally are omitted. *Explanation of symbols :* 9 = ninth abdominal tergite ; 10 L = left hemitergite of tenth segment, 10 LP = process of 10 L ; 10 R = right hemitergite of tenth segment, 10 RP = process of 10 R ; MF = median flap of 10 R ; MS = median sclerite of tenth tergite ; EP = epiproct ; H = hypandrium, or ninth abdominal sternite, HP = process of H ; LCB and RCB = left and right cercus-basipodites ; LPPT and RPPT = left and right paraprocts, LPPT P = process of left paraproct.

Generally it will be easier to identify male specimens of a species by reference to the figures than by the use of the keys.

### KEY TO GENERA OF EUROPEAN AND MEDITERRANEAN EMBIOPTERA

1 Fossilized in Baltic Amber . . . . . . . . ***ELECTROEMBIA***
– Recent species . . . . . . . . . . . . . . 2
2 All instars with two ventral papillae on hind basitarsus. Males always apterous ***HAPLOEMBIA***
– All instars with one hind basitarsal papilla. Males apterous or alate . . . . 3
3 Adult males always alate; wing vein MA ($R_{4+5}$) always unforked. Basal segment of left cercus unlobed and non-echinulate. Right tergal process (10 RP) acutely triangulate, separated from hemitergite (10 R) by membranous area. ***OLIGOTOMA***
– Adult males apterous or alate; when winged, MA always forked. Basal segment of left cercus lobed and echinulate on inner surface. Right tergal process inconspicuous, right hemitergite uniformly sclerotized to its base . . . . 4
4 Adult males apterous or alate. Left cercus with a simple inner lobe or expansion ***EMBIA***
– Adult males always apterous. Left cercus bilobed, with an inner-basal lobe and a larger, dorso-medial distal lobe . . . . . . . . ***CLEOMIA***

## Family **EMBIIDAE** Burmeister, 1839

## ***ELECTROEMBIA*** Ross

*Electroembia* Ross, 1956 : 77.

Type-species. *Embia antiqua* Pictet, 1854, by original designation.

Distribution. Tertiary fossils in Baltic Amber.

Diagnosis. Males apterous, uniformly blackish ; superficially resembling apterous males of *Embia*. Terminalia with membranous, medial cleft of tenth tergite exceptionally broad at base ; median flap (MF) elevated, ridge-like, micro-echinulate anteriorly, caudally continuous with inner margin of right hemitergite (10 R) which has a small, spine-like apical process (10 RP) ; process of left hemitergite (10 LP) projected straight back, twisted and terminated as a very fine, acute point ; caudal margin of composite left paraproct (LCB + LPPT) bearing a broadly-rounded, micro-echinulate lobe ; basal segment of left cercus gradually expanded from base to apex on inner side to become peculiarly wedge shaped, inner surface extensively micro-echinulate. Hind basitarsus with two ventral papillae ; plantar setae rather sparse, the basals much larger than the distals.

Remarks. This genus is not closely related to *Embia* Latreille. It appears to have affinities with other genera, such as *Rhagadochir* Enderlein and *Chirembia*

Davis of the Ethiopian region, which belong to a complex of related genera centred in the Ethiopian and Neotropical regions. *Electroembia* is not a primitive genus and it is not inconceivable that living representatives could occur in the present fauna of Asia Minor or North Africa.

As I mentioned before (1956), male apterism in Embioptera is most prevalent in regions experiencing a prolonged dry season and thus apterism in *Electroembia* suggests that the climate of the Baltic region at the time of fossilization was probably Mediterranean in type with a summer dry season and a wet winter and spring.

### ***Electroembia antiqua*** (Pictet)

(Text-fig. 1)

*Embia antiqua* Pictet, 1854 : 370, pl. XL, fig. 28. Pictet & Hagen, 1856 : 56, pl. 5, fig. 7. Lucas, 1883 : XXVI. Friederichs, 1906 : 236.
*Oligotoma antiqua* (Pictet) Hagen, 1885 : 176. Handlirsch, 1906–08 : 894. Krauss, 1911 : 47. Enderlein, 1912 : 95.
*Haploembia antiqua* (Pictet) Davis, 1939 : 562, figs. 7–15. Stefani, 1955 : 116.
*Electroembia antiqua* (Pictet) Ross, 1956 : 79, 2 figs.

Syntypes. Four specimens, stage or sex not indicated. Originally deposited in the Geological-Paleontological Institute, Humboldt University, Berlin. According to information I have received, the box which contained these specimens is now empty and the specimens cannot be located.

Syntype data. Baltic Amber.

Plesiotypes. Two males and one nymph in Geologisches Staatsinstitut, Hamburg (Scheele collection).

Remarks. I have nothing further to add to my 1956 redescription of this species based on specimens loaned to me by the Geological Institute in Hamburg. Although it is possible that several species of the order potentially may be collected in Baltic Amber, the concept of the name *antiqua* may be fixed to this redescription. One must also consider the remote possibility that the Hamburg specimens are Pictet's subsequently moved from their original place of deposit.

My 1956 figure based on the above specimens is here republished for the benefit of entomologists not having ready access to the geological periodical in which it first appeared.

### ***EMBIA*** Latreille[1]

[1] Synonymy complete. Citations incomplete.

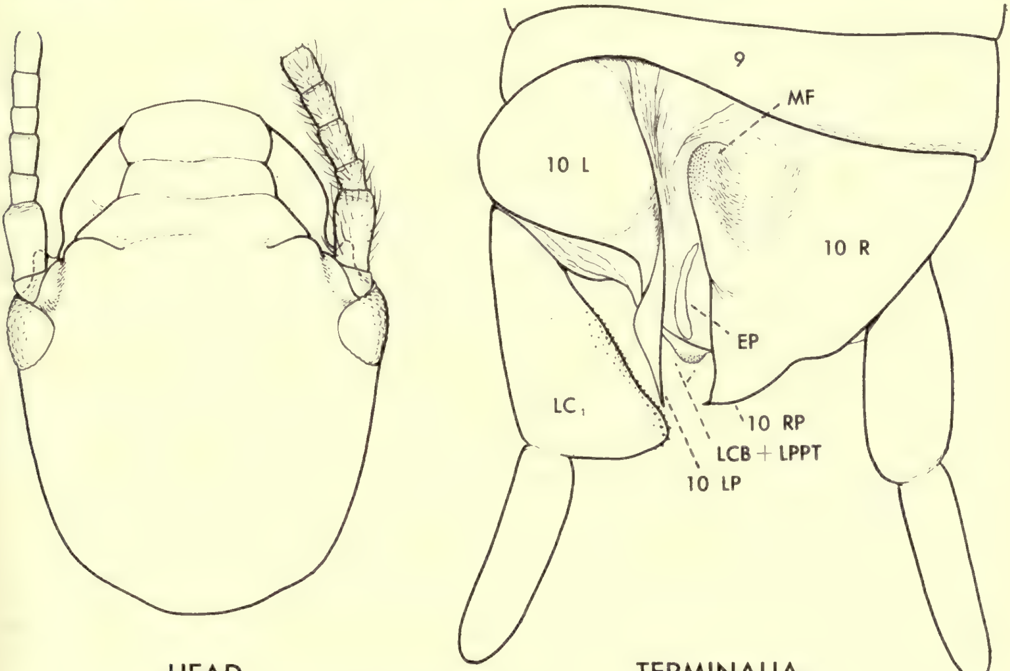
*Embia* Latreille, 1825 : 437.
*Euembia* Verhoeff, 1904 : 201 [name for spp. with alate males]. Enderlein, 1909 : 180 [As syn. of *Embia*].
*Monotylota* Enderlein, 1909 : 188 (Type-species : *Embia ramburi* R.-K., 1905). Davis, 1940*a* : 324 [As syn. of *Embia*].

Type-species. *Embia savignyi* Westwood, 1837, by original monotypy.

Distribution. Southern Europe southward into southern Africa and eastward into S.W. Arabia. Prefers semi-arid life zones. Absent in tropical rain forest.

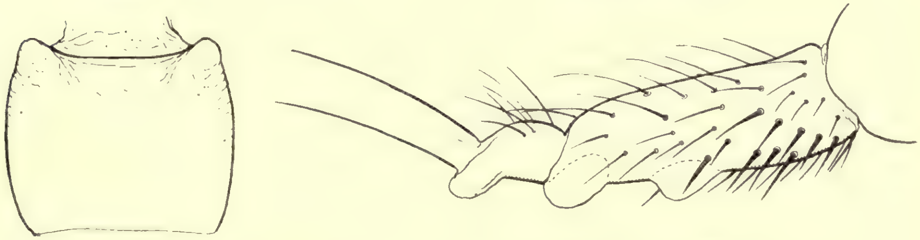
Revisions. Krauss, 1911; Enderlein, 1912; Davis, 1940*a*.

Diagnosis. Males apterous or alate, usually blackish but with some uniformly pale, tan species, or species with prothorax reddish. Head usually with small eyes; antennae with short segments which do not have exceptionally long setae, apical segments never contrastingly pale; mandibles usually elongate, parallel-sided with apical teeth usually curled ventrad and not clearly visible from above; submentum seldom large, or heavily sclerotized. Body form rather stout with relatively thick, short legs; hind basitarsi short with only a terminal ventral papilla. Wings, if present usually short in relation to body size; MA ($R_{4+5}$) always forked (except in aberrant individuals); cross-venation never extensive. Abdominal terminalia



HEAD

TERMINALIA



SUBMENTUM

HIND BASITARSUS

FIG. 1. *Electroembia antiqua* (Pictet). Important characters of male plesiotype in Baltic Amber. (Republished from Ross, 1956). Explanation of symbols on page 279.

with tenth tergal cleft always narrow; left hemitergite (10 L) often strongly arched well sclerotized, often with inflexed caudal margins; left process (10 LP) always simple, usually short, outwardly-curved, distally-tapered, and acutely-pointed; right hemitergite (10 R) more extensive than 10 L with margins (especially the inner) weakly sclerotized; right process (10 RP) poorly developed, usually a small point or weak lobe directed beneath caudal margin of 10 R and not visible from above; median flap (MF) well developed, elongate, caudally-lobed and separated from 10 R for most of its length by a narrow, membranous emargination. Epiproct sclerite (EP) usually obscured by MP, elongate, straight, parallel-sided. Hypandrium (H) extensive, evenly but weakly sclerotized; its lobe (HP) submedial, broadly rounded apically; weakly sclerotized on left side strongly so on right side. Composite left paraproct (LCB + LPPT) well developed, highly interspecifically variable; usually bearing a short, talon-like, sclerotic process on caudal margin and often a rounded nodule on ventral surface (in some species one or both of these structures may be absent or sub-obsolete). Right cercus-basipodite (RCB) a ventral half ring and with the probable right paraproct (RPPT) fused along its basal margin. Cerci rather short, never with distal segment contrastingly pale or white; basal segment of left cercus ($LC_1$) interspecifically variable, with a single, echinulate lobe on inner side; basal segment of right cercus sclerotic only on inner side, outer side largely membranous, at least baso-laterally; apical segments of both cerci subequal.

Females. Without useful generic characters except for the short hind basitarsi with only one ventral papilla. Paragenital sternites of abdomen often with special sclerotic developments.

Remarks. The genus *Embia* promises to be one of the largest and most difficult of the order due to much apparent current evolutionary activity manifested by recognizable, but difficult-to-define, differentiation in various populations. The genetic stock present in Europe is very limited but in North Africa several species-groups are present which have diversified to form an interesting array of species and, perhaps, races.

One species, *Embia savignyi* Westwood is typically Ethiopian and seems to be centred in southern Sudan and western Ethiopia. It entered the Mediterranean region (probably with the assistance of man's commerce) by way of the irrigated zones of the Nile Valley and has been carried to Crete and possibly other eastern Mediterranean regions. It also may be expected in oases of the eastern Sahara.

From Libya westward, and northward through Spain, and the islands and shores of the western Mediterranean, the fauna of *Embia* is very distinct from the Ethiopian and this probably reflects long isolation from southern stocks. It is possible, however, that there is some southern contact by way of Spanish Sahara and Mauritania. The Embioptera fauna of these regions is completely unknown, however.

The main value of the present treatment should be a clarification of the identity of most of the older species on the basis of their holotypes. Attention also is called to the complexity of the genus *Embia* in North Africa. In the past almost any winged male from this region was simply identified as *mauritanica* Lucas. It is now evident that the genus is highly diversified and plastic.

Due to limited collecting the present treatment of North African species is principally based on a study of a mere 48 adult males from 25 scattered localities, chiefly in N.E. Algeria and Tunisia. Twelve species have been distinguished in this study but several discrepant specimens on hand cannot be assigned to any of these species. It is hoped that adequate series will aid their future determination. It is possible, however, that a thorough survey and study of series will reveal clinal blends and overlaps of some of the species here named and show that in some cases clear-cut species or racial definitions will be difficult, if not impossible, to attain. The tendency of embiids, particularly those apterous in both sexes, to inbreed in limited areas, should result in at least slight differentiation of various populations. Also, inhospitable arid climates with periodic dry cycles might tend to periodically reduce population size and thereby increase chances of genetic differentiation.

To reflect apparent relationships of species, the following treatment indicates a number of species-groups. Most of the species can be distinguished by use of the following key and reference to the figures of the terminalia.

### KEY TO EUROPEAN AND MEDITERRANEAN SPECIES OF *EMBIA*

### ADULT MALES

| | | | |
|---|---|---|---|
| 1 | | Left paraproct (LCB + LPPT) with a distinct caudal process on its posterior margin . . . . . . . . . . . . | 2 |
| – | | Left paraproct without process; or, at best, with a minute barb-like point not visible from above . . . . . . . . . . . | 6 |
| 2 | (1) | Submentum heavily sclerotized, lateral margins strongly inflexed; median flap (MF) of terminalia sclerotic, as black as hemitergites (10 L and 10 R); left paraproct (LCB + LPPT) with ventral nodule very large, as heavily sclerotized and as darkly pigmented as the paraproct; always apterous . | ***ramburi*** |
| – | | Submentum weakly sclerotized, lateral margins not strongly inflexed; median flap (MF) weakly sclerotized or submembranous, paler than hemitergites; left paraproct without ventral nodule or, if present, weakly or partially sclerotized; apterous or alate . . . . . . . . . . | 3 |
| 3 | (2) | General colour light brown, or tan, with head golden. Process of left paraproct (LCB + LPPT) slender, tapered to fine point, similar to apex of left tergal process. Nile Valley and Eastern Mediterranean . . . | ***savignyi*** |
| – | | General colour dark brown to black, head usually concolorous with body. Process of left paraproct variable, apex broadly acute or blunt. Southern Europe and North Africa . . . . . . . . . . . | 4 |
| 4 | (3) | Process of left paraproct small, much less prominent than left tergal process. Always apterous . . . . . . . . . . . . | 5 |
| – | | Process of left paraproct large, as conspicuous as left tergal process. Apterous or alate . . . . . . . . . . | ***mauritanica*** group[2] |
| 5 | (4) | Very large (about 18 mm. long), resembling an adult female; left tergal process outwardly arcuate; paraproct process conate, its length equal to basal width; inner side of basal segment of left cercus broadly arcuate. Tunisia . | ***biroi*** |
| – | | Smaller (about 10 mm. long); left tergal process nearly straight, paraproct process very slender, talon-like, its length much greater than basal width; inner side of cercus acutely lobed. Sardinia . . . . . . | ***nuragica*** |
| 6 | (1) | Left paraproct process a minute, sharp point, or a rudiment beneath posterior margin of paraproct . . . . . . . . . . . . | 7 |
| – | | Left paraproct without trace of a process (*silvestrii* Group) . . . . . | 10 |
| 7 | (6) | Mandibles with apical teeth curled beneath subapicals (*amadorae* Group) . | 8 |
| – | | Mandibles with apical teeth well separated, all visible from above (*algerica* Group) . . . . . . . . . . . . . . | 9 |

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[2] It is impractical to key out the species of this group. The worker should compare the figures accompanying the species treatments in making identifications.

8 (7) Head quadrate, almost as broad as long; left tergal process (10 LP) short, slightly extended beyond paraproct margin; median flap (MF) dark brown; basal segment of left cercus expanded mesad from its extreme base. Portugal and Spain? . . . . . . . . . . . . **amadorae**[3]

– Head elongate-oval; left tergal process longer, extended well beyond paraproct margin; median flap pale, translucent; basal segment of left cercus narrow basally before mesal expansion . . . . . . . **larachensis**

9 (7) Apterous; head as dark as body; basal segment of left cercus obtusely lobed, apical two-thirds broad to apex and only slightly tapered distad . . **algerica**

– Alate; head golden, body brown; basal segment of left cercus acutely, symmetrically lobed, caudomesal side incurved and strongly tapered distad . **lecerfi**

10 (6) Left tergal process (10 LP) with sides nearly straight, subparallel, its apex blunt and rounded; basal segment of left cercus with lobe evenly hemispherical . . . . . . . . . . . . . **lucasi**

— Left tergal process with sides sinuous, unevenly spaced, its apex acutely pointed; basal segment of left cercus with lobe greatly expanded and extended caudad **silvestrii**

## The *SAVIGNYI* Group

### ***Embia savignyi*** Westwood[4]

(Text-fig. 2)

(Without name) Savigny, 1825?, pl. II, figs. 9, 10 [no explanation].

*Embie* Latreille, 1825 : 437. Audouin, 1825 : 194 [explanation of Savigny's plate]. Latreille, 1829 : 256.

*Embia savignyi* Westwood, 1837 : 372, pl. 11, fig. 1. Davis, 1940*a* : 325, figs. 1–6 [designates neotype].

*Embia aegyptiaca* Blanchard, 1845 : 283 [*nom. nud.*] (type loc. EGYPT). Davis, 1940*a* : 327 [as syn. of *savignyi*].

*Donaconethis ehrenbergi*, *sensu* Enderlein, 1912 : 107 [*D. ehrenbergi* Enderlein, *sensu* 1909, appears to be a distinct species.].

*Embia enderleini* Esben-Petersen, 1915 : 86, figs. 10–11 (Type : male from Dabba el Gardegna, Sudan). Davis, 1940*a* : 327 [as provisional syn. *savignyi*].

Neotype. Male, deposited in the British Museum (N.H.). Designated by Davis (1940*a*).

Type data. Sudan : G. R. F. Medani (*H. W. Bedford*), 22.xii.22, Blue Nile.

Diagnosis. Males moderate in size, robust, always winged. Generally light brown or tan in colour with head golden ; prothorax slightly paler than pterothorax ; body and legs extensively subcutaneously mottled with rust-red ; terminalia chestnut-brown with processes of left tergite and left paraproct dark amber, median flap whitish. Body length averaging 10 mm.

Important structural features : Cranium broad, quadrate, sides subparallel ; eyes small, interspace equal to four eye-widths ; mandibles elongate, sides parallel, apical teeth strongly curled ventrad. Terminalia with left process (10 LP) very narrow, evenly tapered, abruptly curved to left at apical third ; median flap (MF) narrow, longitudinally wrinkled, devoid of spiculation, acute ; process of left paraproct (LCB + LPPT) very narrow, claw-like, resembling

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[3] I suspect that *fuentei* Navás, when redescribed, will key to this couplet.

[4] Synonymy complete. Citations incomplete.

left tergal process, evenly arcuated ventrolaterad; ventral nodule of paraproct small, often conate; basal segment of left cercus broadly, obtusely rounded on inner side, not forming an abrupt lobe.

Females. Without distinctive specific characters but separable from those of all other North Africa and European species by the pale coloration which is similar to that of males.

General distribution. Chiefly southern Sudan and S.W. Ethiopia, thence northward down the Nile to its delta. Probably sporadic occurrence by introduction on islands and shores of eastern Mediterranean Sea.

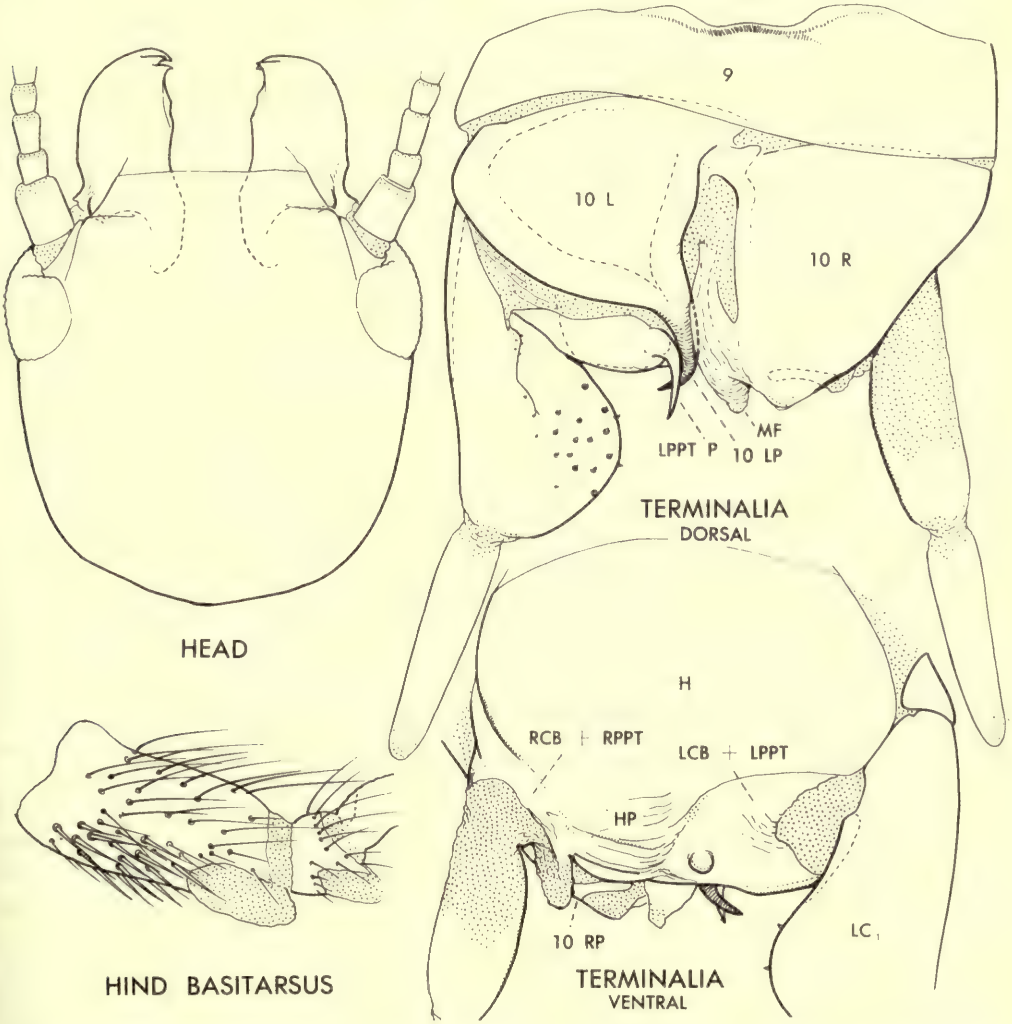
9
10 L
10 R
MF
LPPT
P
10 LP
TERMINALIA
DORSAL
HEAD
H
RCB + RPPT
LCB + LPPT
HP
10 RP
LC$_1$
HIND BASITARSUS
TERMINALIA
VENTRAL

FIG. 2. *Embia savignyi* Westwood. Important characters of male plesiotype from Maadi, Cairo, Egypt. Explanation of symbols on page 279.

Mediterranean region records. EGYPT: Maadi, Cairo, 1 ♂ at light ix.1953 (*Hoogstraal*) (C.A.S.). CRETE: 1 ♂ (*Handlirsch*) (Vienna Mus.). S. PALESTINE: Deir El-Belah, 8 mi. S.W of Gaza, 1 ♂, 24.IV.1917 (*E. E. Austen*).

Remarks. In spite of the fact that *savignyi* is the first known species of the order, very few specimens have been collected. The males are distinct from all others treated in this paper in their pale coloration and the form of the terminalia processes. Like those of so many pale species inhabiting arid regions, males frequently are attracted to light, especially at the beginning of the rainy season.

## The *MAURITANICA* Group

### ***Embia mauritanica*** Lucas

(Text-fig. 3)

*Embia mauritanica* Lucas, 1849; III, pl. 3, fig. 2; Lucas, 1859: 442 [biol.]. McLachlan, 1877: 375 [after Lucas]. Hagen, 1885: 190 [after Lucas]. Saussure, 1895: 339. Friederichs, 1904: 236 [after Lucas]. Krauss, 1911: 61, pl. 4, fig. 20; pl. 5, fig. 20. [ex parte]. Enderlein, 1912: 36, 106, figs. 14, 15. Navás, 1915: 371 [records]; Navás, 1923: 9 [record]. Friederichs, 1934: 442 [biol.]. Davis, 1940*a*: 328, 331, figs. 17–23 [redesc. cotypes]. Stefani, 1953: 88 [comparison]. Michieli, 1953: 90; Michieli, 1957: 555 [misident. of *E. tyrrhenica* Stefani].

*Embia tunetana* Navás, 1919: 26, fig. 28; Navás, 1934: 109 [record]. Davis, 1940*a*: 330, figs. 29–31 [redesc. type]. (Type: ♂ on slide, Paris Mus. labelled " Tunisie E. Le Moult "). **syn. n.** based on type comparisons.

LECTOTYPE (by present designation). Male, on slide, deposited in the Museum National d'Histoire Naturelle, Paris.

Type labels. " Algérie M. Lucas 67–96 Embia mauritanica Lucas type 1850 " (written in the hand of Lucas according to Dr. J. Carayon).

Type locality fixation. ALGERIA: Boghar, by present designation. The vial which contained the lectotype did not have a specific locality label but it was one of three housed in the same museum jar with other vials similarly labelled (in the hand of Lucas), one of which also included the additional word " Bogher ". This is taken to be an alternate spelling of Boghar, a town in the mountains south of Alger which must have been a favourite collecting area of Europeans. Lucas (1859: 442) refers to collecting embiids at Boghar, Medeah Plateau, during April, 1850.

It is interesting that two of the above vials contained, in addition to males of *mauritanica*, several specimens of a very distinct new species of *Embia* with apterous males. Hereinafter this is named after Lucas. This demonstrates that two or more species of the genus may occur in the same habitat and one must take this into consideration in making field cultures of females and nymphs.

Description of lectotype. Appearance: Medium sized, winged, robust, generally unicolorous dark brown. Colour details (in alcohol, before slide preparation, probably faded due to more than a century of preservation in alcohol): Cranium dorsally dark chestnut-brown with faint, paler basal maculation; blending to golden brown at sides before eyes and along lateral clypeal margins; ventrally dark chestnut-brown with yellowish brown gula. Eyes black. Basal antennal segment concolorous with cranium, second paler, all others light brown. Mandibles amber-yellow with margins and dentations reddish amber to piceous; all other sclerotized mouthparts medium brown except for darker submentum. Remainder of body and legs various shades of brown; prothorax and its legs darkest; membranous regions pale tan. Dimensions: Body length 14·5 mm., fore wing length 7·2 mm., breadth 2·1 mm.

Important structural features: As figured. Left hemitergite (10 L) about as long as broad with rounded outer and inner margins; left process (10 LP) dorso-ventrally flattened and thin throughout, exceptionally broad with characteristic form, as figured; right process (10 RP) a rudimentary, small, acute point projected beneath margin of 10 R. Left paraproct without ventral nodule; its process flat, thin, projected meso-ventrad from inner caudal margin of paraproct, abruptly produced with sub-parallel sides terminated as an asymmetrical acute point. Basal segment of left cercus narrow basally, inner side curved inward before its expansion as a rather narrowly rounded subapical inner lobe which bears only a few irregularly-scattered peg-like echinulations.

Female. No available specimens.

Remarks. *E. mauritanica* appears to be a variable species probably extensively distributed along the Mediterranean slope of Algeria eastward through coastal

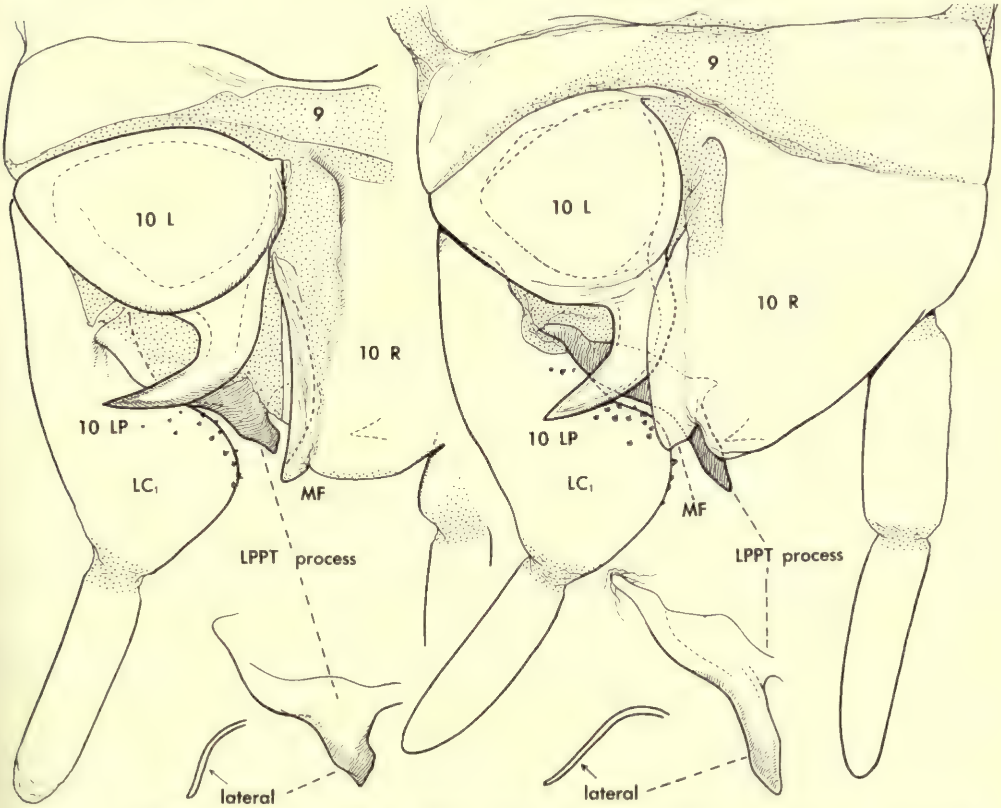

FIG. 3. *Embia mauritanica* Lucas. Right—Important characters of terminalia of lectotype. Left—Important characters of holotype of synonym *Embia tunetana* Navás. Explanation of symbols on page 279.

Tunisia and Tripolitania. In its eastern range it appears to become paler and some Tripolitanian specimens are decidedly bicolorous with a brown body and contrasting yellowish or golden head. The most distinctive feature of *mauritanica* is the broad, flat, blade-like, left tergal process (10 LP) which varies from an apically-broad form with lateral flanges to a narrowly-acute form without flanges. The form of the paraproct process is also distinctive in being thin, flattened and from its base parallel-sided, not apically twisted. There is considerable variation in the length of this process.

I can find no good characters for regarding *tunetana* Navás as a valid species. The paraproct process is consistently shorter and broader in the holotype of *tunetana* and the head of many Tunisian specimens may be paler. At best, *tunetana* might prove to be a race of *mauritanica*. However, races of North African *Embia* cannot be defined on the basis of the present limited sampling.

The series available to the writer are cited and discussed as follows :

ALGERIA : Constantine (*Eaton*) (McLachlan Coll. B.M.N.H.), 1 ♂ 21.vi.94, 1 ♂ 17.v.95. Similar to lectotype but one male has a slight nodule developed on the inner base of the left paraproct. This male also has a more darkly pigmented, more deeply wrinkled median flap.

ALGERIA : La Calle, 4.vii.96 (*Eaton*) (McLachlan Coll. B.M.N.H.). 1 ♂. Has a narrower left tergal process with an elevated, median apical line ; paraproct process short and broad as in type of *tunetana*.

ALGERIA : Tarfaia (*A. Thery*) (Paris Mus.). 1 ♂ det. as *mauritanica* by Enderlein. Left tergal process narrowly and evenly tapered to apex ; paraproct process elongate, asymmetrically, acutely pointed.

ALGERIA : Hamman-Meskoutine (*W. R. & K. J.*), 10 ♂ collected at various dates between May 6 and 17, 1914 (B.M.N.H. Coll.). Series shows minor variation in left tergal and paraproct processes and an occasionally a small nodule on the left paraproct surface.

TUNISIA : Mateur, 2.v.43 (*G. T. Riegel*) 1 ♂ (C.A.S. Coll.). Has a more golden-brown head than Algerian specimens.

TUNISIA : Tunis, 13.vii.43 (*G. T. Riegel*) 1 ♂ (C.A.S. Coll.). Larger than Mateur specimen ; head as dark as body ; left tergal process very narrow and sharply pointed ; paraproct process longer than type of *tunetana*.

TUNISIA : " Tunisie E. Le Moult " (Navás Coll. Zaragoza). 1 ♂ probably from same lot as type of *tunetana*. Head as dark as body ; terminalia similar to type of *tunetana*, as figured (Text-fig. 3*a*).

TRIPOLITANIA : Homs, vii.1913 (*A. Andreini*) 2 ♂ (Genoa Mus.). Somewhat smaller and more slender than Algerian series with head decidedly yellowish in contrast to brown body. These specimens were identified as *E. tunetana* by Navás.

Except for certain pale-headed Tunisian and Tripolitanian specimens, the entire series has very dark coloration which appears blackish to the naked eye.

## *Embia attenuata* sp. n.

(Text-fig. 4A)

Holotype. Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data. Algeria : La Guetna (near Mascara), 6.vi.1929 (*J. C. Bradley*).

Description of holotype. Appearance : Winged ; size, colour and general structure essentially the same as in *mauritanica*, differing in details of terminalia, as follows : Left tergal process (10 LP) angled meso-caudad, symmetrically and evenly tapered to apex ; abruptly but smoothly curved latero-caudad at apical third and terminated as a needle-sharp, sclerotic point (in *mauritanica* this process generally is broad throughout most of its length and abruptly curved outward almost immediately from its base and the apex is broadly acute). Apical lobe of median flap (MF) broadly rounded (in *mauritanica* this appears to be consistently narrowly rounded). Left paraproct (LCB + LPPT) with a large, broad, dome-like, meso-ventral nodule which is micro-rugose on its mesal surface (in *mauritanica* such a nodule is absent) ; paraproct process with base broad (half width of sclerotic caudal margin), irregularly-tapered to apex (sides thus not extensively parallel, as in *mauritanica*). Basal segment of left cercus greatly expanded on inner side immediately from inner-base to form an evenly arcuate, semi-circular lobe which is more densely echinulate at its base than apically (in *mauritanica* the lobe is acutely rounded

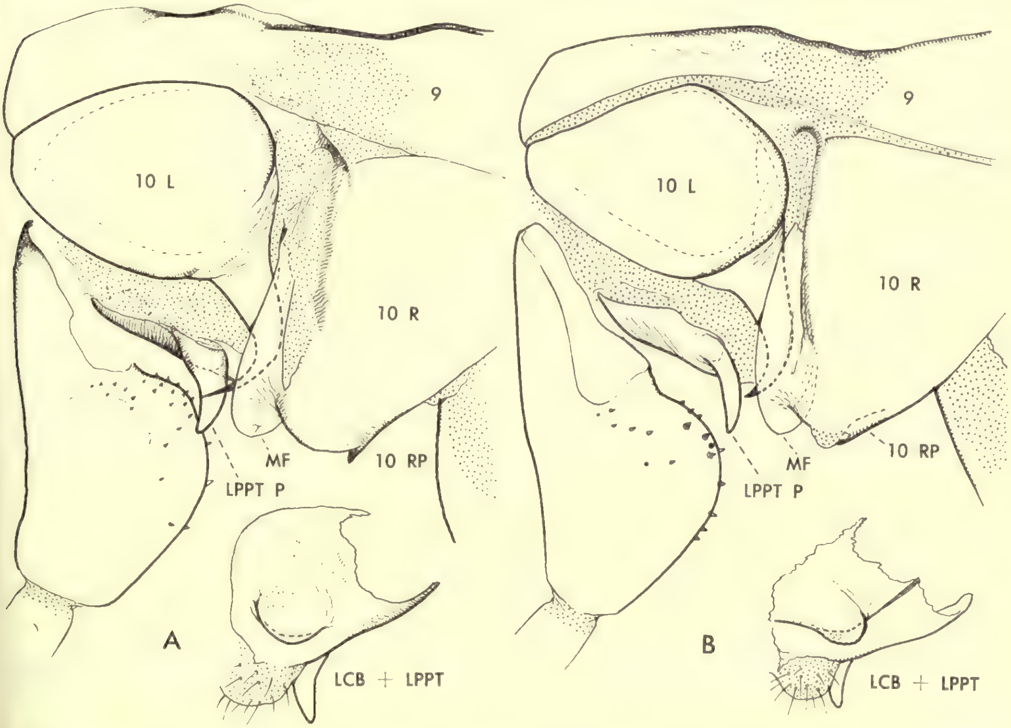

FIG. 4, 4A. *Embia attenuata* n. sp. Important characters of terminalia of holotype. 4B. *Embia lesnei* n. sp. Important characters of terminalia of holotype. Explanation of symbols on page 279.

and begins about halfway on the inner side of the cercus), the dorsal surface of the segment is slightly concave. Dimensions (on slide): Body length 12·2 mm.; fore wing length 6·5 mm., breadth 1·75 mm.

Paratype. One male with holotype data deposited in British Museum (N.H.).

Female. I have one large, mature female with holotype data but, inasmuch as all other North African species of this complex of the genus are known only from male specimens, there is no comparative basis for a satisfactory description of species characters. It is doubtful that females will exhibit adequate characters for specific differentiation.

### ***Embia lesnei*** **sp. n.**

(Text-fig. 4B)

Holotype. Male, on slide, deposited in the Museum National d'Histoire Naturelle, Paris.

Type labels. Algeria: "Ain Oulmen" (handwritten on blue paper), "A Ain Oulmen 8 Juin 1893," "Museum Paris Algerie P. Lesne—97" (last two labels printed on cards).

Description of holotype. Appearance: Winged; similar to *mauritanica*, but much smaller and apparently generally paler in colour. Most closely related to *attenuata* but differing in terminalia characters, as follows: Left tergal process (10 LP) shorter, with apical point broader and much less curved outward. Left paraproct (LCB + LPPT) with ventral nodule more abruptly defined and projected laterad, instead of ventrad as in *attenuata*; most significant is a transverse fold arcuating across the paraproct in line with caudal margin of ventral nodule (this fold is absent in *mauritanica* and *attenuata*); paraproct process narrow at basal origin, parallel-sided, curved meso-caudad, its surface finely and longitudinally strigose. Left cercus as in *attenuata*. Dimensions (on slide): Body length 11·0 mm.; fore wing length 5·5 mm., breadth 1·5 mm.

Paratypes. None.

Female. No specimens.

Remarks. It may be necessary to refer to Dr. P. Lesne's field notes to determine the exact position of Ain Oulmen. His published account (*Bull. Mus. Nat. Hist., Paris*, 1895, no. **3**, p. 1) of his 1892–93 travels in north-eastern Algeria does not mention the place. I assume that Oulmene which appears on my map just south of Aïn Beïda in N.E. Algeria is the same place. If so, the type localities of *attenuata* and *lesnei* must have significantly distinct environmental conditions.

### ***Embia contorta*** **sp. n.**

(Text-fig. 5)

Holotype. Winged male, on slide, deposited in the British Museum (N.H.).

Type labels. "Biskra N. Africa Lewis Ahl 1892", "McLachlan Coll. B.M. 1938–674."

Description of holotype. Appearance: Similar to *mauritanica*, but larger, robust, winged; uniformly dark brown, almost black. Colour details (dry): Cranium dark chestnut-brown, devoid of pattern, darkest on vertex; margins of anterior tentorial pits and clypeus pale amber.

Eyes black. Basal two antennal segments dark brown, other segments medium brown. Preclypeal and labral membranes tan ; labrum dark chestnut-brown, blending to amber anteriorly and laterally. Mandibles yellow-amber, blending to dark reddish amber laterally and anteriorly ; other mouthparts including submentum, medium brown with yellow-tan membranes. Cervical sclerites golden brown, surrounding membranes tan. Remainder of insect with sclerites shining dark mahogany-brown, prothorax somewhat darker ; head noticeably paler than thorax. All legs concolorous with thorax, paleness of femoro-tibial joints confined to membrane. Terminalia sclerites largely blackish brown except, as follows : caudal margin of left hemitergite and process golden, outer margin of process narrowly reddish amber ; median flap pale tan ; elevated area of left paraproct blending to pale amber ; margins of hypandrium process narrowly pale brown. Dimensions (on slide) : Body length 15·4 mm. ; fore wing length 8·25 mm., breadth 2·25 mm.

Important structural features : Cranium broad, quadrate ; sides as broad at caudal angles as behind eyes. Terminalia with left hemitergite (10 L) obtusely angulate at outer base of left tergal process (10 LP) which has a narrow base and gradually tapers to form a long outwardly-curved, parallel-sided process, irregularly tapered apically. Median flap (MF) greatly elongate, finely strigose ; pale, translucent amber in colour. Left paraproct (LCB + LPPT) largely

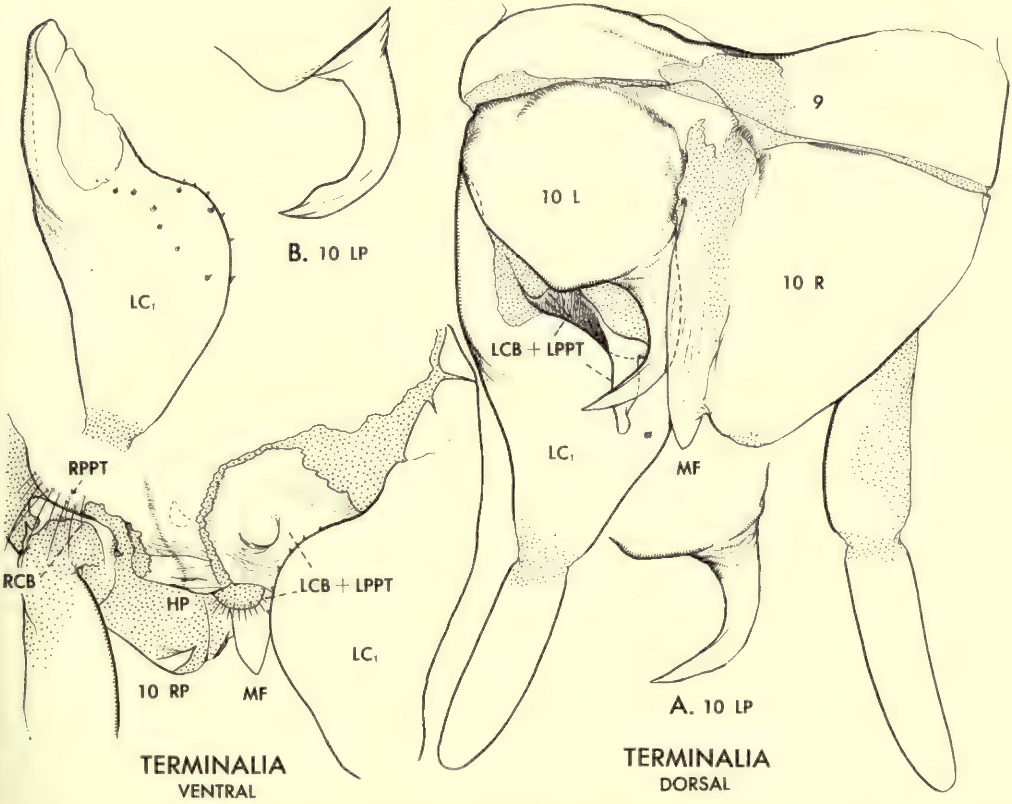

FIG. 5. *Embia contorta* n. sp. Important characters of terminalia of holotype. 5A. Detail of left tergal process. 5B. Detail of left tergal process of variant topotype. Explanation of symbols on page 279.

pale, but sclerotic, with a very low, broad ventral nodule ; caudal process narrow at base thence expanded medially before attenuating to a slightly twisted truncate tip, process not strongly curved ventrad. Basal segment of left cercus broadly, evenly arcuated from inner base to apex ; bearing scattered, large echinulations on inner edge.

Paratypes. Four males on slides deposited in British Museum (N.H.) and the California Academy of Sciences. All from Biskra and selected from a larger Biskra series as closely matching the size and structural characters of holotype. Date and collector data, as follows : 1 ♂, iv.1908 (*W. Rothschild*) ; 3 ♂ from McLachlan Collection, (*Eaton*), with dates : 22.v.91, 12.v.94, 13.iv.95.

Female. Unknown.

Additional specimens studied. 7 ♂ from Biskra not matching holotype. Dates and collectors, as follows : 1 ♂, 22.v.91 (*Eaton*, McLachlan Coll., B.M.N.H.) ; 1 ♂, same but 5.v.94 ; 1 ♂, no date (*G. C. C.*, B.M.N.H.) ; 1 ♂, no date (Pascoe Coll. 93–60, B.M.N.H.) ; 1 ♂, no date (*A. Thery*, Enderlein Coll., Warsaw) ; 2 ♂, " Biskra Paa, Sandhöje orkenen 3–1869 Meinert " (retained from larger series in Copenhagen Mus.).

1 ♂, "Algerie, Touggourt, J. Surcouf 1922" (Paris Mus.), det. as *mauritanica* by Navás ; 1 ♂, " Krauss Sahara Oued Mzab, bei Ghardaza, 19.4.1893 " (Stuttgart Mus.) ; 1 ♂, " Tozeur, S. Tunisia G.C.C." (B.M.N.H.).

TUNISIA : Kebili (N. Banks, M.C.Z.). Two males similar to typical *contorta* but having the left tergal process acuminated to a narrow, fine point. One specimen has a broad, low, paraproct nodule, the other has no such nodule.

Remarks. The peculiar shape of the terminalia processes and the broadly-rounded lobe of the left cercus clearly indicate that the population of *Embia* occurring at Biskra is specifically distinct from *mauritanica*. The latter must be a species characteristic of the Mediterranean slope of north Africa. However, the series from Biskra is highly variable and it is necessary to limit the designation of paratypes to specimens matching the holotype.[5]

The Meinert specimens collected in 1869 represent the extremity of divergence from the holotype. The body is only 11 mm. long. The wings are much smaller with reduced venation (one specimen has *MA* unbranched), and the left paraproct has a pronounced ventral nodule. It is possible that such specimens represent a second species of *Embia* in the locality. Another possibility is that a dry year, or series of dry years, may result in generations of smaller, undernourished individuals which exhibit allometric variation in characters used in classification. The problem can be settled by the analysis of large series of males reared in cultures from Biskra.

In addition to the above variable series, I have before me two males from N.E. Tunisia which do not quite fit the definition of *contorta* but seem related to this species. Perhaps specialized collecting and rearing of adequate series from N.E. Algeria and Tunisia will reveal the existence of a complex of valid species and/or races.

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[5] It is the writer's policy to regard paratypes as specimens showing the *nature of the holotype* and not necessarily the nature of the type population or species concept.

## *Embia sinuosa* sp. n.

(Text-fig. 6)

Holotype. Male, on slide, deposited in the Museum National d'Histoire Naturelle, Paris.

Type labels. " Museum Paris TUNISIE Maknassy C. Dumont 1927 ", " 20.4.27."

Description of holotype. Appearance : Similar to *contorta* but smaller than average. Differing in details of terminalia, as follows : Left tergal process (10 LP) generally long, slender, only slightly outwardly-curved, constricted medially then slightly expanded before its asymmetrically-acute apex. Left paraproct (LCB + LPPT) with a prominent, asymmetrical, ventral nodule directed latero-caudad and darkly pigmented on caudal face ; paraproct process narrower at base than medially, apex acuminate and bent ventrad ; outer caudal margin of paraproct sclerotic, incurved. Basal segment of left cercus with inner side symmetrically, obtusely angulate with a few scattered echinulations. Dimensions : Body length 11·5 mm., fore wing length 6·0 mm., breadth 1·5 mm.

Paratypes. None.

Female. Unknown.

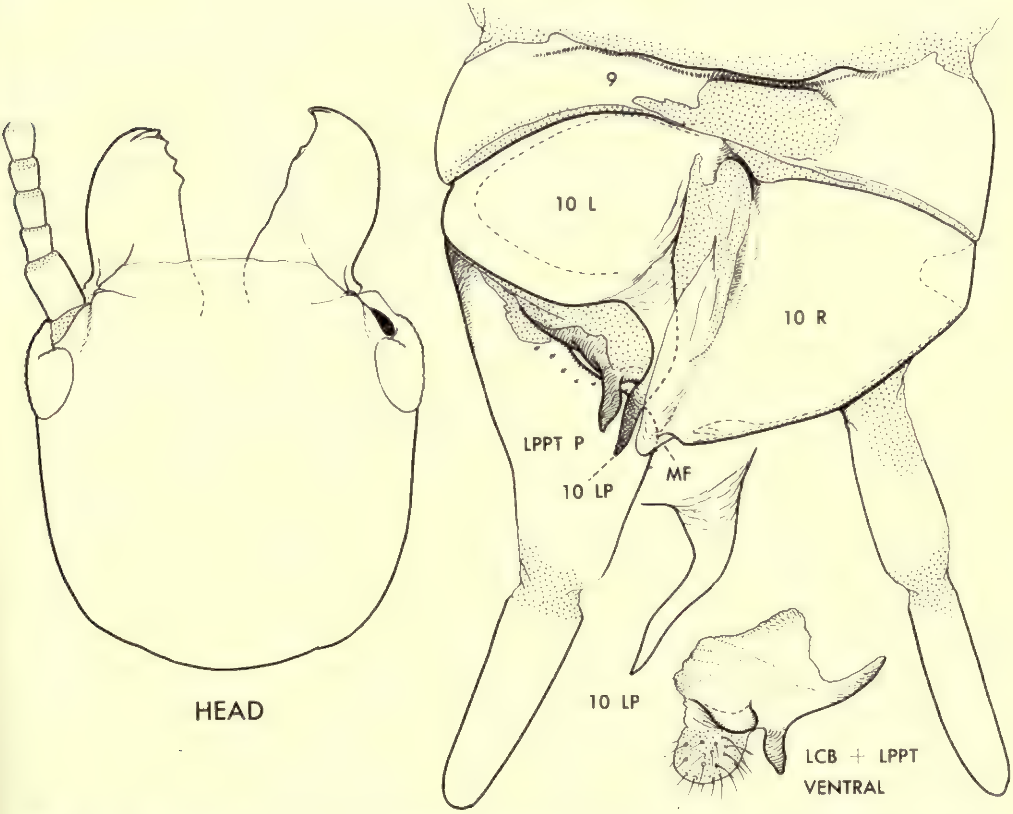

FIG. 6. *Embia sinuosa* n. sp. Important characters of holotype. Explanation of symbols on page 279.

Remarks. This specimen bears the Navás identification label *Embia tunetana* Navás but it is not closely related to this synonym of *mauritanica*. It is most closely related to *contorta* Ross, but differs in its smaller size ; sinuosity of the left tergal process ; the pronounced ventral lobe of the left paraproct ; the smaller, ventrally hooked paraproct process (horizontal in *contorta*) ; and the smaller, more angulate, inner lobe of the left cercus.

Before me is an additional Paris Mus. male labelled : " Tunisie Bou Hedma C. Dumont 1929 " " Fevier " " Embia tunetana Nav. P. Navás S. J. det." which agrees with the holotype of *sinuosa* except for its flat, parallel-sided left tergal process which is diagonally truncate at its apex. It may represent a distinct species or race but it will be best to await access to adequate study series before proposing an additional name.

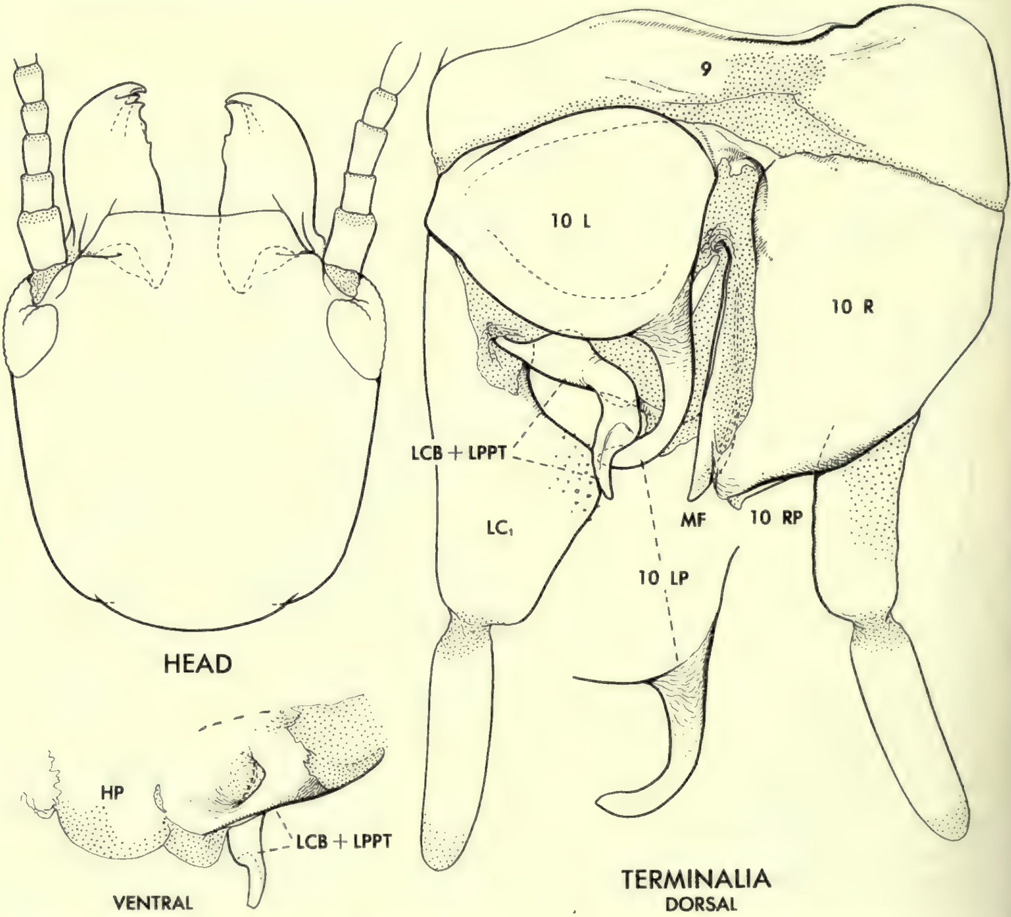

FIG. 7. *Embia maroccana* n. sp. Important characters of holotype. Explanation of symbols on page 279.

## ***Embia maroccana*** **sp. n.**

(Text-fig. 7)

Holotype. Male, on slide, deposited in the Instituto Español de Entomología, Madrid.

Type labels. " Teng-Tina " [Morocco], " Embia mauritanica Lucas. ♂ " (in Krauss' hand).

Description of holotype. Appearance : Small, slender, winged ; generally dark brown with head golden brown. Colour details (dry) : Cranium golden brown, clouded anteriorly with mahogany-brown; eyes, antennae, and palpi dark mahogany-brown. Remainder of insect dark brown except for amber-yellow left paraproct process with a reddish amber apex. Dimensions (on slide) : Body length 9·5 mm. ; fore wing length 4·5 mm., breadth 1·0 mm.

Important structural features, as figured : Similar to *contorta* but with head narrower and mandibles shorter. Terminalia with caudal margin of left hemitergite (10 L) arcuate instead of obtusely angulate ; left process (10 LP) long, smooth-surfaced, not tilted, parallel-sided except for slight narrowing at arcuation which occurs at apical third, apex abruptly and broadly acute. Ventral surface of left paraproct (LCB + LPPT) transparent, centrally produced as a low, conate nodule directed ventro-laterad and covered with micro nodules ; paraproct process very broad and parallel-sided at basal half, then abruptly narrowed on inner edge to half of basal width, apex slightly tapered and squarely-truncate. Basal segment of left cercus not broadly arcuate on inner side, as in *contorta*, but obtusely triangulate in outline, as figured.

Paratypes. None.

Female. Unknown.

Remarks. *E. maroccana* can be distinguished from *contorta* by a comparison of terminalia figures. Its occurrence far to the north-west of Biskra, and north of the Atlas range, may account for its differentiation.

## ***Embia tyrrhenica*** Stefani

(Text-fig. 8)

*Embia tyrrhenica* Stefani, 1953*b* : 84, fig. 1 ; 1953*d* : 1 [biol.] ; 1959*a* : 622 [biol.] ; 1959*c* : 3 [Key] ; 1960*b* : 111 [Yugoslavian records].

Holotype. Male in alcohol, deposited in the Instituto di Zoologia, Universita di Cagliari, Sardinia.

Type data. SARDINIA : " Gonnesa (Sardegna meridionale) ".

The following synopsis of characters and the accompanying figure are based on a paratype from Gonnesa.

Male. Appearance : Medium sized, alate ; dark mahogany-brown throughout. Cranium elongate-quadrate, devoid of dorsal pattern. Antennae almost unicolorous ; basal segments slightly darker, 18-segmented (complete). Mandibles very elongate, somewhat emarginate on inner-basal half ; distal teeth curled beneath subapicals ; submentum small, moderately sclerotized, lateral margins arcuate, not inflexed. Terminalia with left margin of cleft straight ; left hemitergite (10 L) large, triangulate ; left process (10 LP) very short, broad basally, acutely tapered and slightly out-curved distad ; right hemitergite (10 R) large ; median flap (MF) pale tan, not very transparent. Left paraproct (LCB + LPPT) devoid of ventral nodule or pronounced surface sculpture ; caudal margin sclerotic, gradually angled meso-caudad from left side to form outer margin of a caudal process which is straight on inner side and abruptly hooked ventrad at apex. Basal segment of left cercus large, sclerotic; broadly, evenly arcuate on inner side from extreme base to apex; with a few coarse echinulations on extreme edge. Dimension (on slide): Body length 10 mm.; fore wing length 4·75 mm., breadth 1·25 mm.

Female. Various shades of mahogany-brown, membranes not distinctly paler than sclerites; without inter-segmental thoracic bands. Accessory gland with very large, amber semifused sclerites and two deep fossae beneath vulva with lining sclerotic reddish amber.

Remarks. Stefani described completely apterous as well as micropterous forms of this species from southern Sardinia. Before me are three apterous males from Mandas, an interior locality in southern Sardinia (Gonnesa is on the S.W. coast). These differ from my three Gonnesa paratypes in having the left tergal process (Text-fig. 8B) longer, more acuminate and abruptly curved outward at 90° before the apex. Also, the lobe of the left cercus is smaller and more narrowly rounded. Close study may reveal that *tyrrhenica* breaks up into distinguishable populations, or even a complex of races or weak species.

Stefani recorded *tyrrhenica* from a wide range. He noted that specimens from the Rome area identified by Silvestri (1948) as *E. savignyi*, and specimens from Yugoslavia (Rovigno, Istria and Isola di Veglia nel Quarnero, Krk) identified as *E. mauritanica* by Michieli (1956), fit his concept of *tyrrhenica*. It is thus likely that the species, or its close relatives, may occur in many lowland, coastal areas of Italy, and the Balkan Peninsula.

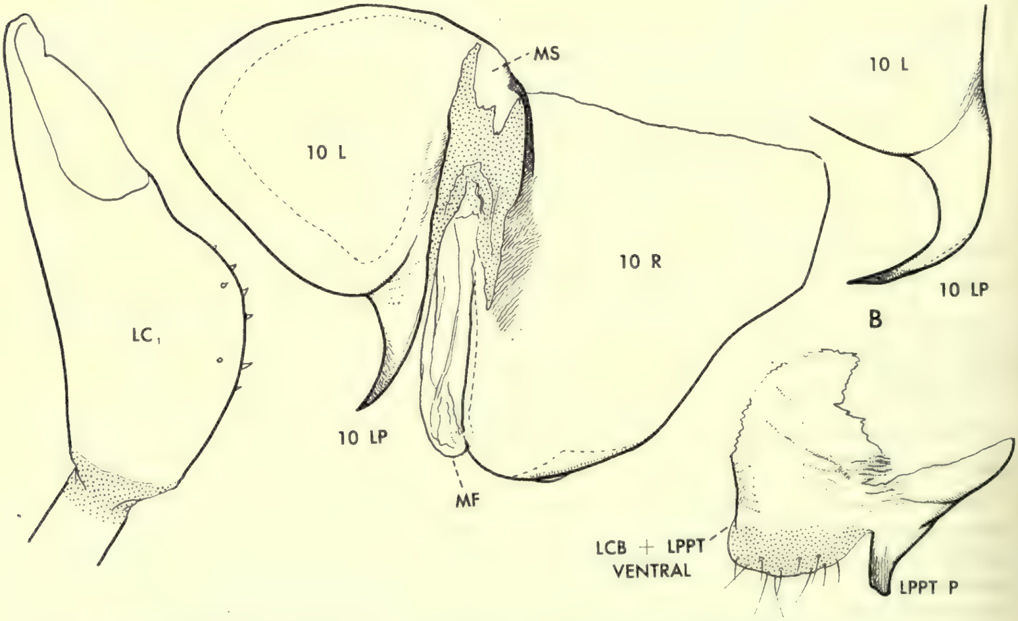

FIG. 8. *Embia tyrrhenica* Stefani. Important characters of terminalia of male topoparatype. 8B. Left tergal process of paratype from Mandas, Sardinia.

Explanation of symbols on page 279.

## The *RAMBURI* Group

### ***Embia ramburi*** Rimsky-Korsakow

(Text-fig. 9)

*Embia ramburi* Rimsky-Korsakow 1905 : 434, figs. Friederichs, 1906 : 215 *et seq.* [biol.] figs. Friederichs, 1907 : 270. Krauss, 1911 : 57, fig. Krausse, 1914 : 103. Rimsky-Korsakow, 1927 : 148. Silvestri, 1934 : 131, fig. Davis, 1940*a* : 331, figs. Stefani, 1953*b* : 90.

*Embia* (*Monotylota*) *ramburi* Rimsky-Korsakow, 1910 : 153 ; 1912*b* : 610.

*Monotylota ramburi* (Rimsky-Korsakow) ; Enderlein, 1909 : 188 ; 1912 : 65, 115, fig. 38. Rimsky-Korsakow, 1912*a* : 18. Friederichs, 1923 : 11 [biol.] ; 1934 : 407, *et seq.* figs. [biol.]. Taborsky, 1938 : 109. Delamare Deboutteville, 1946 : 200 fig. ; 1949 : 24 [biol.]. Ledoux, 1958 : 515, figs. [biol.].

*Embia duplex* Navás, 1908 : 50. Enderlein, 1912 : 67 [as syn. of *H. solieri* in error].

*Haploembia duplex* (Navás), 1918 : 359, fig. 14. Davis, 1939 : 565 [as ? syn. of *ramburi*].

*Embia silvanoi* Navás, 1908 : 51. Enderlein, 1912 : 65 [as ? syn. of *ramburi*]. Davis, 1939 : 566 [as ? syn. of *ramburi*].

*Embia kraussi* Krausse, 1911 : 64 ; 1914 : 103 [as syn. of *ramburi*]. Davis, 1940*a* : 342 [as unrecognizable]. Stefani, 1953*b* : 92 [as syn. of *ramburi*].

*Haploembia* (*Monotylota*) *laufferi* Navás, 1918 : 360, fig. 15. Davis, 1939 : 565 [as ? syn. of *ramburi*].

Type (of *ramburi*). Juvenile male, or female, place of deposit unknown. Perhaps no type specimen exists.

Type data. FRANCE : Villefranche sur Mer (near Russian Zoological Station) collected by Rimsky-Korsakow, 1903.

The following redescription and accompanying figures are based on a topotypic male, one of a series kindly presented by Dr. Renzo Stefani.

Male. Appearance : Apterous, jet-black throughout, membranes brownish tinged with reddish lavender or clouded with smoky black, thus without pale thoracic intersegmental bands. Body length : 12·5 mm. (in alcohol). Colour details : Head jet-black except for gula which is concolorous with membranes ; cranial surface dull in lustre, micro-rugose ; clypeal region especially rugose. All sclerotized body surfaces concolorous with head, micro-rugose. Legs uniformly black except for membranes and extreme apex and claws of each terminal tarsal segment which are golden brown. Important structural features, as figured.

Distribution. Southern FRANCE, SPAIN, ITALY, and certain islands of western Mediterranean.

Remarks. *E. ramburi* is the only member of the genus with a heavily sclerotized submentum in the male with side margins strongly flexed. It is also characterized by its black, sclerotic median flap and the strongly, subterminally-bilobed left paraproct, the ventral lobe of which is a sclerotic round nodule. In much of its range it shares the habitat only with *Haploembia solieri* (Rambur). All instars of *ramburi* can be distinguished from those of *solieri* by the short hind basitarsus with only one ventral papilla. It is doubtful that males of *ramburi* ever are alate.

Friederichs (1934 : 426) claimed to have hybridized *ramburi* and *mauritanica* but the identity of the parents is not clear. In any event, *mauritanica* could not have been involved. Most likely the female parent was *tyrrhenica* which had mated prior to contact with a male of *ramburi*.

Discussion of synonyms. *Embia duplex* Navás, 1908. This name was based on specimens from " Chamartin! (Madrid) " and " Zaragoza ". To date these specimens have not been found in any collection. The original description is too general

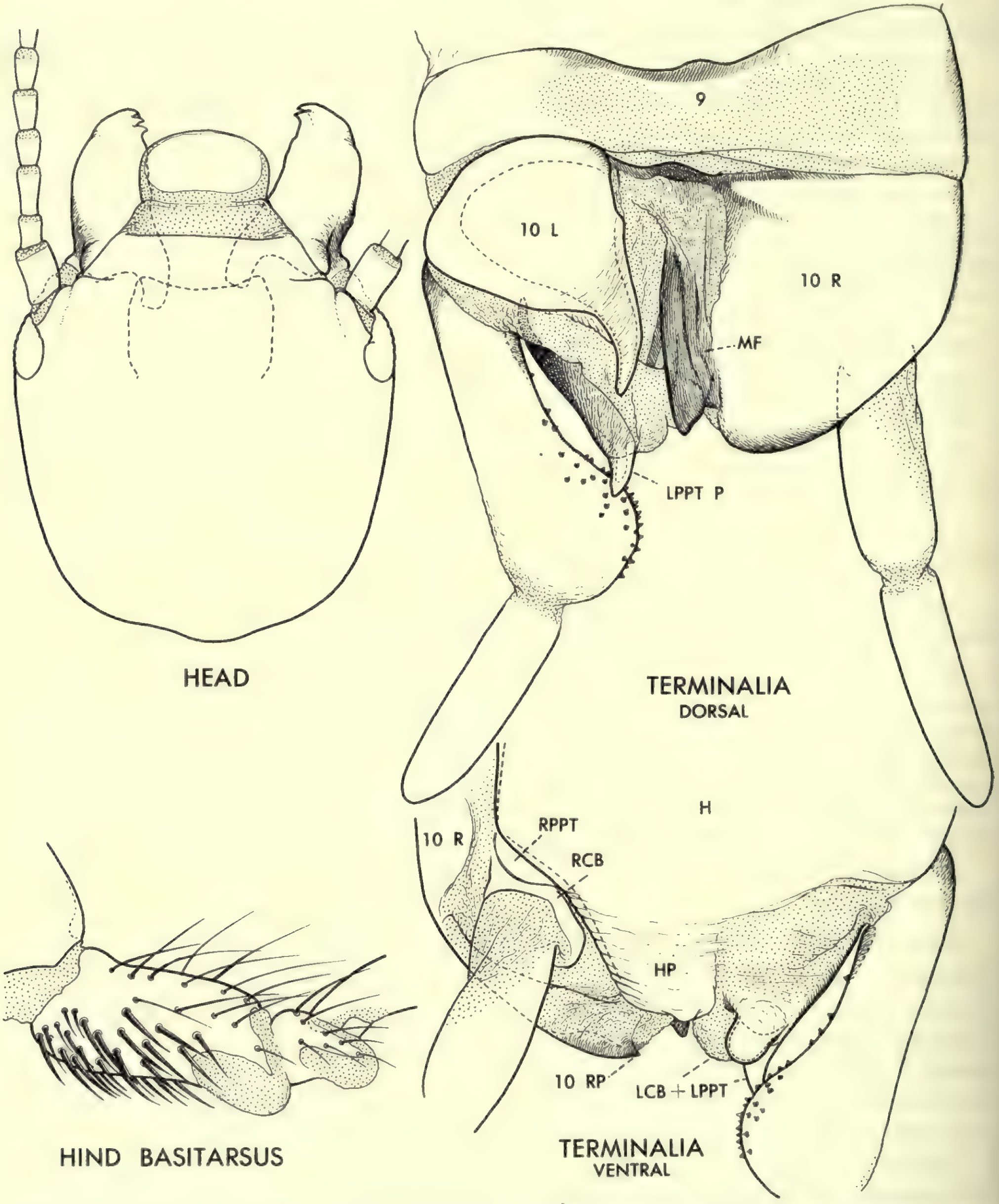
HEAD
9
10 L
10 R
MF
LPPT P
TERMINALIA
DORSAL
H
10 R
RPPT
RCB
HP
10 RP
LCB + LPPT
HIND BASITARSUS
TERMINALIA
VENTRAL

Fig. 9. *Embia ramburi* R.-K. Important characters of a male topotype. Explanation of symbols on page 279.

for specific, or even sex determination. However, the colour note "castanea" suggests that the specimens were not adult males of *ramburi* which are black. In 1918 (l.c.) Navás figured the terminalia of "*duplex*" and cited an additional locality: Mongat (Barcelona). This figure almost certainly represents the terminalia of *ramburi* and I suspect that it was made from a Mongat male and not one of the original types. Therefore, the synonomy of *duplex* with *ramburi* is not yet conclusive on the basis of this figure.

A visit to the type locality of Chamartin (Madrid) might establish the identity of *duplex*, particularly if only one species of the order happens to occur there. *Ramburi* is known from Madrid as recorded below.

*Embia silvanoi* Navás, 1908. Like *duplex*, this species is unrecognizable from the original description. The types, probably nymphs, have not been located in any collection. It may be possible, however, to identify the species through future collecting at the type locality: San Fiel, Spain.

*Embia kraussi* Krausse, 1911. Apparently no types are extant but the type locality is precisely stated: Asuni, Sardinia. The original series was composed of nymphs. In 1914 Krausse, without stating his evidence, and apparently without much knowledge of *ramburi*, placed the name *kraussi* in the synonomy of *ramburi*. Stefani (1953*b*) accepted this conclusion and later collected at Asuni but informed me that he could find only his own species inhabiting the region. Because more than one species of *Embia* occurs at Asuni, and because *ramburi* is known to occur on Sardinia, it is best to continue to place *kraussi* as a synonym of *ramburi* instead of regarding it without evidence to be conspecific with one of Stefani's Sardinian species.

*Haploembia* (*Monotylota*) *laufferi* Navás, 1918. The type of this species was from "Pardo (Madrid)" and, although stated to be in the Navás Collection deposited in Zaragoza, I was unable to find it there. The type was an apterous male and Navás' figure of its terminalia, although poor, suggests that *laufferi* is a synonym of *ramburi*. Further support of this synonymy is an apterous male loaned to me by the Instituto Español de Entomología labelled, "Provincia de Madrid J. Lauffer." This is a typical specimen of *ramburi*. In the same collection there are two mature females labelled, "Pardo (M) 21. V.15," which were identified by Navás as *Haploembia solieri* Rambur. However, unlike those of *solieri*, these females are black and have a short hind basitarsus with a single ventral papilla. They may thus be regarded as females of *ramburi*. This generic misidentification is further evidence of the confused state of Navás' knowledge of the Embioptera.

New records. FRANCE: Marseille, series of adults matured in culture ii.1963 (*L. Bigot*) (C.A.S.). Callian, Dept. Var, v.1946 (*L. Berland*), 1 ♂, ♀, and nymphs, (Paris Mus.). SPAIN: Pego Sn. Juan, Prov. Alicante, v.1959 (*H. Coiffait*) 1 ♂, and nymphs (Paris Mus.). Ronda, 2,500 ft. 30.vi.1925 (*Sheppe*) 1 ♂ (M.C.Z.). Madrid, No. 19, 1 ♂ (McLachlan Coll., B.M.N.H.).

## The *BIROI* Group

### ***Embia biroi*** Krauss

(Text-fig. 10)

*Embia Biroi* Krauss, 1911 : 59, pl. 3, fig. 18. Davis, 1940*a* : 334, figs. 43–44 [after Krauss].
*Monotylota biroi* (Krauss), Enderlein, 1912 : 104, figs. 67–68 [quotes Krauss]. Friederichs, 1934 : 409 [as syn. of *ramburi*, in error].

LECTOTYPE (by present designation). Male, on slide, deposited in the Magyar Nemzeti Museum, Budapest.

Type labels. "Tunis, Gafsa, 1903.III.21, leg Biró." "Embia Biroi Krauss; Typus! (det. Krauss)."

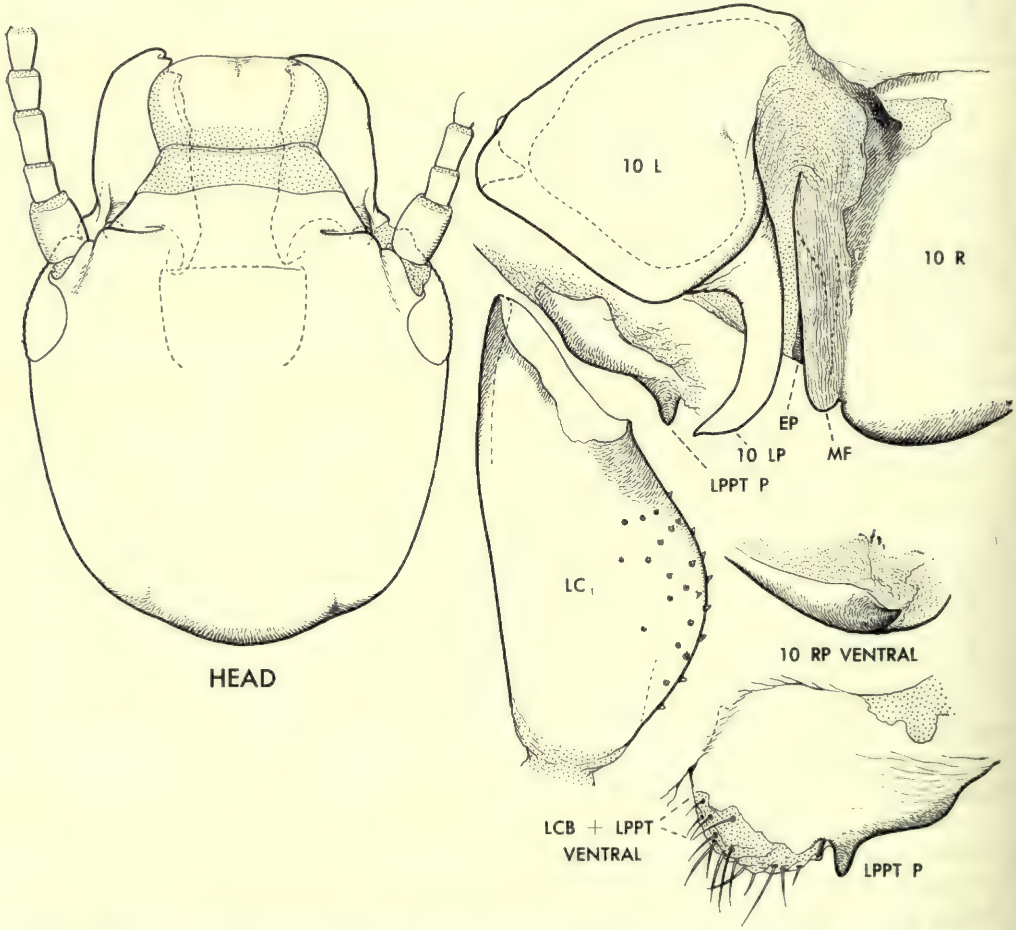
10 L
10 R
EP
10 LP
MF
LPPT P
LC₁
10 RP VENTRAL
HEAD
LCB + LPPT
VENTRAL
LPPT P

FIG. 10. *Embia biroi* Krauss. Important characters of a male topotype. (Type lot). Explanation of symbols on page 279.

Description of lectotype. Appearance: Robust, apterous, brownish; resembling an adult female. Colour in alcohol: Almost uniformly chestnut-brown, slightly darker in sclerotic areas, paler at extremities of legs and antennae. Cranial pattern conspicuous. Body length 18·2 mm.

Important structural features, as figured. Most significant: (1) The elevated promontory of the left hemitergite (10 L) above base of left process (10 LP). (2) The peculiar left process which is almost parallel-sided to its acute apex and exceptionally dorso-ventrally flat, thin, and smooth. (3) The cone-like, sclerotic right tergal process (10 RP). (4) The blunt, short, nodule-like left paraproct process. (5) The absence of a left paraproct nodule. (6) Plantar setae of hind basitarsi are numerous and dense.

Remarks. *E. biroi* is known only from specimens collected by Biró. The type series loaned to me for study by the Hungarian National Museum comprised two males and a female in alcohol. The loan also included a third male, not mentioned by Krauss, which has type data except for the collection data 30.iii.1903. Biró, prior to Krauss' study erroneously identified this male as *Embia mauritanica* Lucas. One of the syntype males was prepared on a slide and here designated lectotype. The third male was retained, by exchange, in the California Academy of Sciences.

*E. biroi* is the largest and most extremely neoteinic of the Mediterranean species of *Embia*.

### ***Embia nuragica*** Stefani

(Text-fig. 11)

*Embia nuragica* Stefani, 1953*b*: 89, fig. 2.

Holotype. Male, in alcohol, deposited in the Museo di Zoologia, Universita di Cagliari, Sardinia.

Type data. SARDINIA: "Sassari (Sardegna settentrionale)."

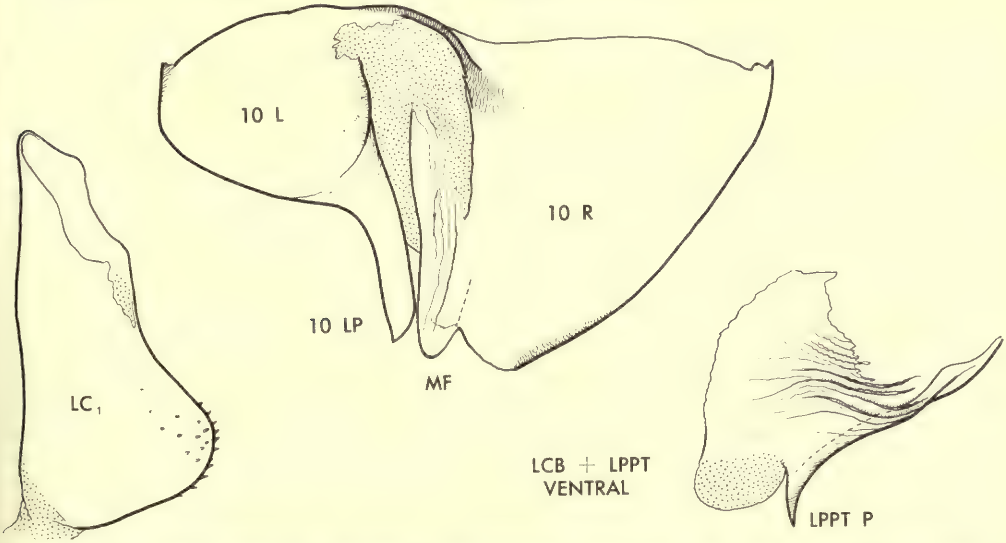

FIG. 11. *Embia nuragica* Stefani. Important characters of terminalia of a male topoparatype. Explanation of symbols on page 279.

The following synopsis of characters and accompanying figure are based on a paratype male from Nuoro, Sardinia.

Male. Appearance : Medium-sized, apterous : head not exceptionally large ; mahogany-brown with thoracic membranes whitish except those of prothorax tinged with purple ; joints between thoracic segments appearing as whitish bands. Cranium oval, nymphaform ; unicolorous dark brown, with or without dorsal pattern. Antennae almost unicolorous brown, 19-segmented (complete). Mandibles tapered distad, concolorous with cranium ; submentum small, uniformly pigmented and weakly sclerotized with non-inflexed, arcuate, lateral margins. Terminalia with cleft extended partially behind left hemitergite (10 L) which is gradually tapered meso-caudad to form a flat, thin, smooth process (10 LP) which is almost straight, parallel-sided and not sharply pointed at apex. Median flap (MF) pale, semi-transparent. Left paraproct (LCB + LPPT) well sclerotized, surface strongly, transversely wrinkled, but devoid of ventral nodule ; inner angle gradually tapered to form a small, acutely-pointed, clear amber, slightly bent process. Basal segment of left cercus acutely lobed beginning at distal half ; echinulations confined to rounded apex of lobe. Body length : 10·0 mm.

Females. Resembling males but larger and lacking the two pale thoracic bands due to uniform reddish tan tinge of all body membranes. Sclerotic plates around orifice of accessory gland absent (this is a good character for distinguishing adult females from those of *tyrrhenica* which may be sympatric).

Remarks. *E. nuragica* is a very distinct species to date found only in several localities in south-central Sardinia. Related species should occur in other Mediterranean regions. The worker is referred to the good original treatment of Stefani for additional details.

## The *AMADORAE* Group

### ***Embia amadorae*** **sp. n.**

(Text-fig. 12)

Holotype. Male, on slide, deposited in the California Academy of Sciences, San Francisco.

Type data. PORTUGAL : Amadora (near Lisbon) 10.V.1949 (*E. Luna de Carvalho*).

Description of holotype. Appearance : Medium-sized, winged, unicolorous dark brown. Colour details (in alcohol) : Cranium piceous brown, dorsal pattern obsolete, medial area slightly paler. Basal segment of antennae piceous brown, segment II chestnut-brown, all other segments yellow-tan. Sclerotized portions of mouth parts, including mandibles, chestnut-brown. Body and legs with sclerotic areas various shades of chestnut-brown with piceous sutures and margins ; pronotum more extensively piceous ; prothoracic and cervical membranes whitish, tinged with rust-red, membranes between pro- and mesothorax cream-white, all other body membranes slightly pink. Terminalia with left hemitergite (10 L) piceous brown, process (10 LP) dark amber margined with piceous ; inner and outer margins of right hemitergite (10 R) piceous, otherwise chestnut-brown ; median flap (MF) medium brown ; ventral sclerites chestnut-brown with longitudinal mesal streak in hypandrium lobe (HP) piceous ; left cercus with basal segment largely dark brown with piceous margins ; right cercus light golden brown except for narrow, piceous inner margin and whitish outer-basal margin ; terminal segments yellow-brown with dark cream tips. Dimensions (on slide) : body length 11·5 mm. ; fore wing length 5·5 mm., breadth 1·2 mm.

Important structural features, as figured : Cranium exceptionally broad, quadrate. Mandibles elongate with apical teeth strongly curled beneath sub-apicals. Left tergal process

(10 LP) rather short, evenly tapered and outwardly arcuate to an acute point. Median flap (MF) darkly pigmented. Left paraproct (LCB + LPPT) large, without ventral nodule; its process almost completely absent, reduced to a minute, piceous point beneath caudal margins. Basal segment of left cercus massive, abruptly enlarged mesally and maintaining great breadth for length of segment, dorsal surface of lobe depressed or concave; echinulations fine, densely concentrated on basal surface of lobe.

Paratypes. Six topotypic males collected with the holotype. Deposited in the California Academy of Sciences, the British Museum, and the Instituto Español de Entomología, Madrid.

These are similar to the holotype except for slight variation in body size and length of the left tergal process (extreme length figured).

Allotype. Female, in alcohol, with holotype data and disposition. Light brown throughout with head, antennae, legs, and cerci amber-yellow. Sclerites of accessory gland large, fused medially, amber in colour.[6]

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[6] This description can be amplified when relative importance of characters is known at the time females of other species are known.

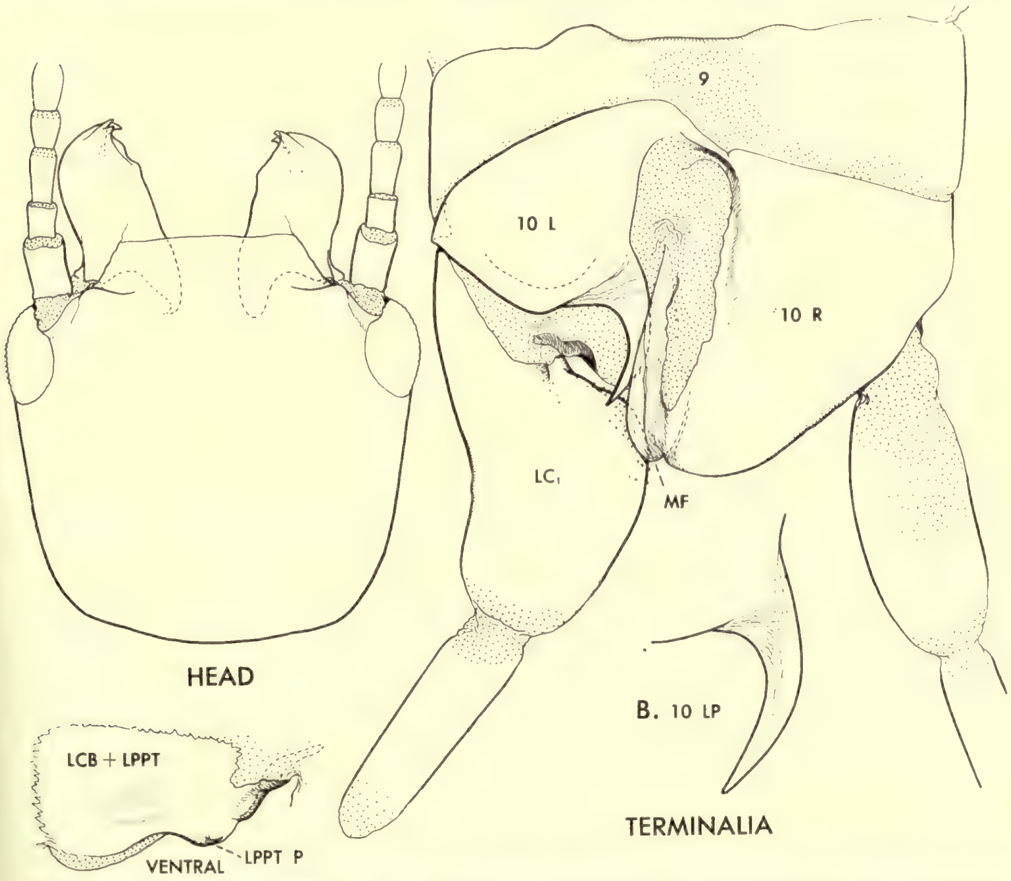

FIG. 12. *Embia amadorae* n. sp. Important characters of holotype (B. detail of left tergal process of variant paratype). Explanation of symbols on page 279.

Parallotypes. Two females in alcohol deposited in the California Academy of Sciences.

Remarks. This species is most distinct in the broad, quadrate form of the head, the greatly reduced paraproct process, and the form of the left cercus.

*E. amadorae* was collected under stones in an exposed rocky ledge area in pasture land. *Haploembia solieri* females were present in the same vial as the type series and therefore the two species must occur together in the habitat. *H. solieri* can readily be distinguished in all stages by its possession of two hind basitarsal papillae instead of one.

In the Instituto Español de Entomología there is a male without locality data which appears to represent *amadorae* except for a slightly distinct left tergal process. It bears only the identification label " *Embia mauritanica* Lucas," in the hand of H. A. Krauss. In searching Krauss' monograph (1911) I find that he referred to only two Madrid Museum specimens, one from Teng Tina (Morocco), the other from Cartagena (Spain). I have studied the former and it became the holotype of my *Embia maroccana* (*vide supra*).

It thus is possible that the second specimen is from Cartagena but lost its locality label after Krauss' study.

It is possible that *amadorae* may prove to be a synonym or, at best, a race of *fuentei* Navás when a topotypic series of that species becomes available for study.

### *Embia fuentei* Navás incertae sedis

*Embia fuentei* Navás, 1918 : 358. Davis, 1940*a* : 343 [as unrecognizable].

Type. Alate male, disposition unknown ; perhaps lost. Not in Navás collections in Zaragoza or Barcelona.

Type data. SPAIN : Pozuelo de Calatrava, Cuidad Real, 1899.

Remarks. Davis (1940*a*) regarded *fuentei* as an unrecognizable species but, in view of its precisely designated type locality, this need not always be so. Eventually the type locality can be revisited and the nature of this valid species can be based on a topotypic series and a neotype designated.

Although *ramburi* R.-K. probably is sympatric (it occurs in the Madrid region to the north), *fuentei* males would be easily distinguished by their alate condition and other characters. It seems unlikely that two distinct species of *Embia* with winged males would be sympatric in south-central Spain, a region which, because of its relatively cold climate, is marginal for the order.

As stated before, *fuentei* may prove to be conspecific with the preceding species, *amadorae*. It also may be closely related to, or the same as, the following new species. I anticipate, however, that future studies based on adequate series collected on the Iberian Peninsula, and in Morocco, will show these three catagories to be closely related members of a larger species or racial complex.

### ***Embia larachensis*** Ross **sp. n.**

(Text-fig. 13)

Holotype. Male, on slide, deposited in the Instituto Español de Entomología, Madrid.

Type data. Morocco : " Larache M. Escalera."

Description of holotype. Appearance : Medium sized, winged, uniformly dark brown. General facies, coloration, and structure similar to *amadorae*, but differing as follows : Cranium and mandibles narrower and more elongate, as figured. Left tergal process (10 LP) more slender at base and longer. Median flap (MF) paler, more transparent. Process of left paraproct (LCB + LPPT) larger and visible from above on caudal margin of paraproct. Basal segment of left cercus incurved at inner-base before its expansion as a well-rounded lobe ; apex of cercus more tapered distad ; surface of lobe more coarsely and sparsely echinulate. Dimensions (on slide) : Body length 9·5 mm. ; fore wing length 4·5 mm., breadth 1·12 mm.

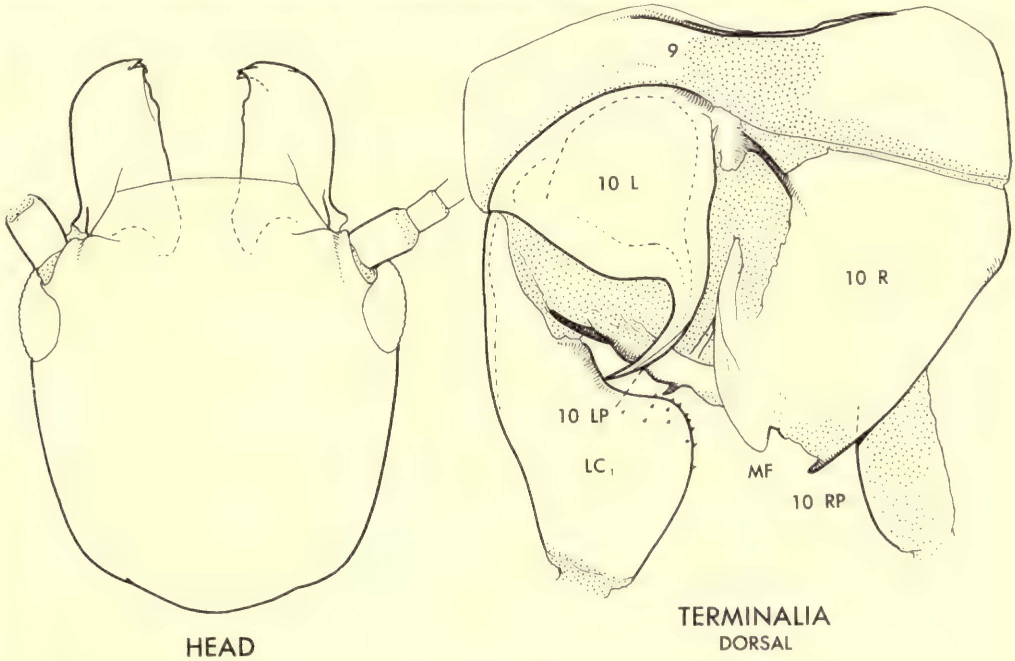

Fig. 13. *Embia larachensis* n. sp. Important characters of holotype. Explanation of symbols on page 279.

Remarks. An additional male with identical data is available but the apex of the left tergal process is broken off and so it is not designated paratype. This specimen is retained in the California Academy of Sciences collection.

## The *ALGERICA* Group

### ***Embia algerica*** (Navás)

(Text-fig. 14)

***Haploembia algerica*** Navás, 1930 : 136, p. 45. Davis, 1939 : 566.
*Embia algerica* (Navás) ; Davis, 1940 : 332, figs. 35–38 [redesc. type].

Holotype. Apterous male, on slide, deposited in the Museum National d'Histoire Naturelle, Paris.

Type labels. " Haploembia algerica Nav. P. Navás S. J. det." (green), " Agadir 24–IV." (pencil) " Type " (red print) " Museum Paris Agadir " (blue), " Miss. LeCerf & Talbot Grand-Atlas 28.IV a 9.VI.1927 ".

Condition. Originally glued on card, genitalia placed in vial by Davis. Prepared on microscope slide by the writer.

Redescription of holotype. Appearance : Small, apterous, dull black with pale membranous band between pro- and mesothorax. Colour details (dry) : Cranium piceous ; dull due to fine, transverse reticulation ; clypeal margin and edges of anterior tentorial pits narrowly brownish ; basal segment of antennae concolorous with head, segment II medium brown, III–VI light brown, VII–XIV medium brown (apical segments broken off). Remainder of insect, including legs, concolorous with head but more shining due to less reticulation ; intersegmental thoracic membranes cream-white ; acrotergite, prescutum, and postnotum piceous ; legs piceous basally, blending to medium brown distad ; pleural membranes of abdomen purplish brown. Body length : 10 mm. (elongated in slide preparation).

Important structural features : Cranium elongate, rectangulate ; sides behind eyes straight, evenly convergent to the arcuate caudal margin. Eyes small, nymphaform. Mandibles

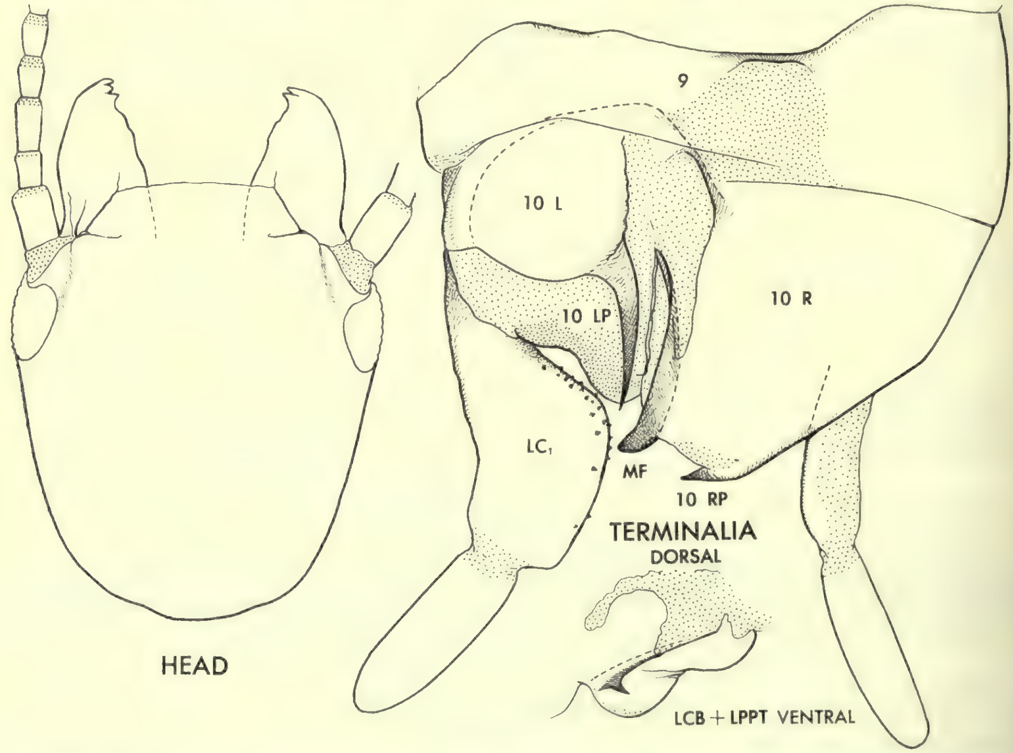

FIG. 14. *Embia algerica* Navás. Important characters of holotype. Explanation of symbols on page 279.

tapered from base to apex, apices acute, apical teeth not curled beneath subapicals. Submentum well sclerotized ; lateral margins strongly inflexed, especially toward base ; anterior margin weak.

Terminalia well sclerotized, sclerites well defined and contrasting with membranous areas. Left hemitergite (10 L) with outer and basal margins sclerotic, inner-apical margin sclerotized but not projected over base of process ; this process (10 LP) almost straight, only slightly outwardly-arcuate, long, slender, evenly and acutely tapered from base to extremely sharp apex. Right hemitergite (10 R) evenly sclerotized, outer-apical margin broadly, obtusely angulate ; its process (10 RP) pointed inward yet visible from above. Median flap (MF) well sclerotized, especially at caudal apex, darkly pigmented ; evenly arcuate to form a narrow sheath. Epiproct sclerite (EP) very narrow, thread-like, slightly twisted. Left paraproct (LCB + LPPT) heavily sclerotized beneath caudal margin, thence abruptly, weakly sclerotized in basal half ; process not visible from above, this process small, sclerotic, located on inner angle at juncture of contrasting sclerotization. Basal segment of left cercus basally narrow, then abruptly angled mesad to form a lobe which remains broad to segment apex ; lobe flat, meso-caudal surface densely echinulate.

Female. Unknown.

Remarks. In the Paris Museum I found a second male with data identical to the holotype, including the Navás identification label " *Haploembia algerica* ". This has been transferred by exchange to the California Academy of Sciences. It matches the holotype in every detail.

## *Embia lecerfi* sp. n.

(Text-fig. 15)

Holotype. Male, on slide, deposited in the Museum National d'Histoire Naturelle, Paris.

Type labels. " TAFINGOULT Goundafa 1500 a 1600 m 10 V Miss. LeCerf & Talbot Grand Atlas 28.IV a 9.VI.1927 ". The locality is in Morocco.

Description of holotype. Appearance : Small, slender, winged ; dark piceous brown with head golden brown. Colour details (dry) : Cranium basically golden brown, devoid of definite pattern, clouded with dark brown between eyes ; clypeus golden brown. Antennae uniformly piceous brown (only 11 segments present). Labrum and other mouthparts dark brown except mandibles which are largely golden amber. Remainder of specimen and legs dark piceous brown except for a cream-white thoracic band formed by pale membranes between pro- and mesothorax. Processes of terminalia and cerci mahogany-brown. Dimensions (on slide) : Body length 9 mm. ; fore wing length 4 mm., breadth 1 mm.

Important structural features, as figured : Cranium elongate-oval. Mandibles exceptionally short for the genus (almost as in *Oligotoma*), outer margins broadly arcuated and tapered distad ; teeth of equal size and spacing, the apicals not curled beneath subapicals. Submentum evenly, moderately sclerotized. Hind basitarsus exceptionally elongate for the genus, more than twice as long as broad ; plantar setae few in number, widely spaced. Abdominal terminalia, as figured, of special significance : the long, slender, evenly-tapered, smoothly arcuate left tergal process (10 LP) ; position and caudal projection of right tergal process (10 RP) ; well-sclerotized, micro-strigose median flap (MF) ; the position and form of the left paraproct process and the acutely angulate inner lobe of the left cercus which has coarse echinulations and is somewhat concave on its meso-basal surface.

Paratypes. None.

Female. Unknown.

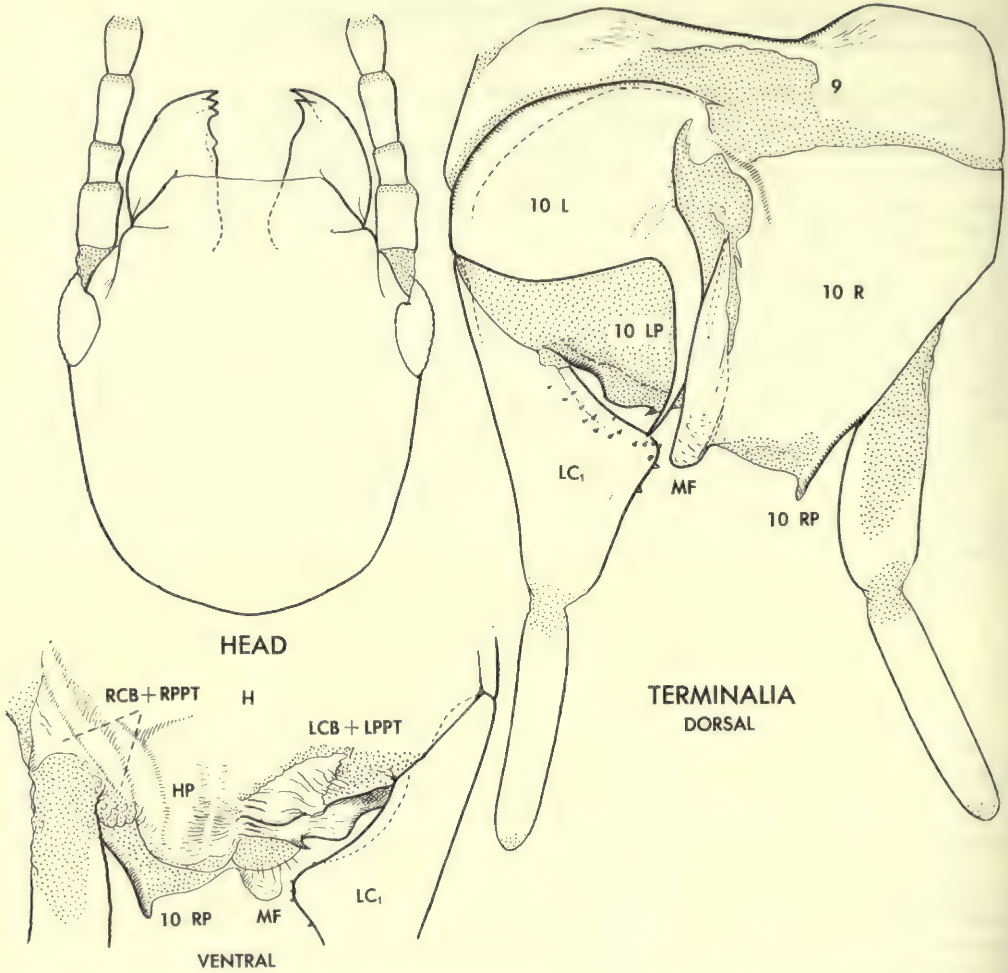
9
10 L
10 R
10 LP
LC$_1$
MF
10 RP
HEAD
TERMINALIA
DORSAL
RCB + RPPT
H
LCB + LPPT
HP
10 RP
MF
LC$_1$
VENTRAL

Fig. 15. *Embia lecerfi* n. sp. Important characters of holotype. Explanation of symbols on page 279.

Remarks. *E. lecerfi* is very closely related to *algerica* but immediately separable by its winged condition, pale coloration, shorter mandibles, more sparsely setose hind basitarsi, and its more acutely angulate lobe of the left cercus.

## The *SILVESTRII* Group

### ***Embia silvestrii*** Davis

(Text-fig. 16)

*Embia silvestrii* Davis, 1940*a* : 333, figs. 39–42.

Holotype. Apterous male, on slide, deposited in the Museum National d'Histoire Naturelle, Paris.

Type labels. " Embia silvestrii Davis, Holotype ♂. Oulad Messelem, Algeria, 25.V.93."

Condition. The balsam preparation made and studied by Davis had many of the specimen's structures obscured by muscle tissue shrivelled within the specimen. A new slide preparation which reveals the additional details is described and figured at this time.

Description of holotype. Appearance : Rather small, apterous, head proportionately large, elongate ; general colour very dark brown. It is possible that this specimen originally had a pale band at each thoracic joint. Dimensions (on slide): Body length 9 mm. ; cranial length (clypeal to caudal margin) 1·4 mm. ; width (behind eyes) 1·25 mm.

Important structural features : Cranium elongate-oval, sides at first subparallel and feebly arcuate, then convergent and evenly arcuate across caudal margin. Eyes small, nymphaform. Mandibles elongated, somewhat tapered towards apex ; outer-apical margins rounded ; distal teeth not abruptly curved ventrad. Submentum slightly wider than long, heavily sclerotized, lateral and anterior margins sclerotic and inflexed ; anterior margin evenly, inwardly arcuate. Left hemitergite (10 L) with all but inner-basal margin sclerotic, not projected across base of process (10 LP) which arises on the inner-apical angle, sides subparallel but sinuous. Process of right hemitergite (10 RP) small but well sclerotized, produced as an acute, ventrally-directed spine. Median flap (MF) elongate, sheath-like, about as well sclerotized as right hemitergite

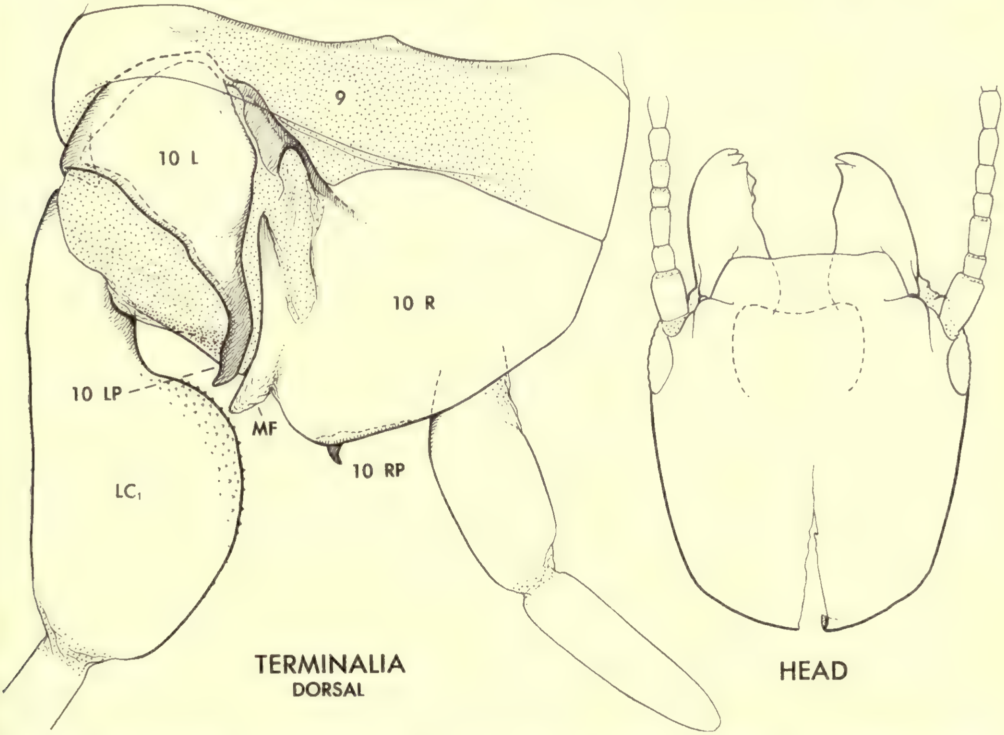

Fig. 16. *Embia silvestrii* Davis. Important characters of holotype. Explanation of symbols on page 279.

(10 R) but more so anteriorly. Left paraproct (LCB + LPPT) sclerotic, transversely wrinkled but devoid of processes or nodules of any sort. Basal segment of left cercus distinctive ; narrow and tubular at extreme base then abruptly expanded on inner margin to form a massive, broadly arcuate, finely-echinulate lobe.

Female. Unknown.

Remarks. The form of the left cercus and left tergal process, and the simple nature of the left paraproct, readily distinguish *silvestrii* from all other known species.

### ***Embia lucasi*** Ross **sp. n.**

(Text-fig. 17)

Holotype. Male, on slide, deposited in the Museum National d'Histoire Naturelle, Paris.

Type labels. " Mus. Paris Bogher M. Lucas 67–96 " " *Embia mauritanica* Lucas (Type) 1850 ".

Locality interpretation. " Bogher " apparently is another spelling for Boghar, a small town south of Alger in Alger province, Algeria. It also is the fixed type locality of *E. mauritanica* Lucas.

Description of holotype. Appearance : Medium sized, apterous ; generally dark mahogany-brown with broad pale bands between thoracic segments. Colour details (in alcohol) : Cranium dark mahogany-brown with paler basal pattern and four small paler spots in a transverse line between eyes. Clypeus and sides before eyes golden brown. Basal antennal segment mahogany-brown, II light brown, others tan becoming darker distad (16 segments present). Labrum and mandibles mahogany-brown, other mouthparts medium brown. Prothoracic sclerites and legs dark mahogany-brown ; cervical and other posterior membranes cream-white. First acrotergite and both spinasterna amber, surrounding membranes and anterior margin of mesoscutum cream-white ; these pale areas combining to form a conspicuous broad pale annulation between pro- and mesothorax. Other thoracic segments and legs dark mahogany-brown except for pale amber postnotum, and cream-white adjacent membranes and anterior margin of metascutum. These combine to form a second, somewhat narrower, pale thoracic band. Abdomen dark mahogany-brown with membranes almost concolorous. Dimensions (on slide) : Body length 11·5 mm.

Important structural features, as figured : Head oval, caudal extremity well rounded ; mandibular teeth well spaced, the apical teeth not curled beneath the subapicals ; submentum well sclerotized. Terminalia with medial cleft of tenth tergite relatively broad basally and extended latero-basad behind left hemitergite (10 L) which is unusually small with weak margins ; left process (10 LP) dorso-ventrally thin, symmetrically projected from 10 L, elongate, sides extensively parallel, outer side flared out before the apex which is rounded, spatulate and weakly sclerotized. Median flap (MF) rather short ; strongly, longitudinally furrowed. Left paraproct (LCB + LPPT) devoid of caudal process or ventral nodule. Basal segment of left cercus very narrowly tubular at base, then abruptly inflated distad as a well-rounded inner lobe ; inner echinulations very dense, even, fine.

Paratype. Topotypic male deposited in the California Academy of Sciences.

Females. With coloration paralleling that of male.

Additional record. ALGERIA : Cherchell, 1.ix.48 (*B. Malkin*), 4 nymphal males and females. The pale thoracic bands, and appearance of the terminalia forming beneath the derma of late penultimate males, gives hint that this series represents *lucasi*.

Remarks. *Lucasi* is one of the most distinct species of the genus and immediately recognized by its simple left paraproct and blunt left tergal process. The peculiar thoracic banding aids superficial recognition.

The species is named after the celebrated collector who was the first to record observations of Embioptera in the field.

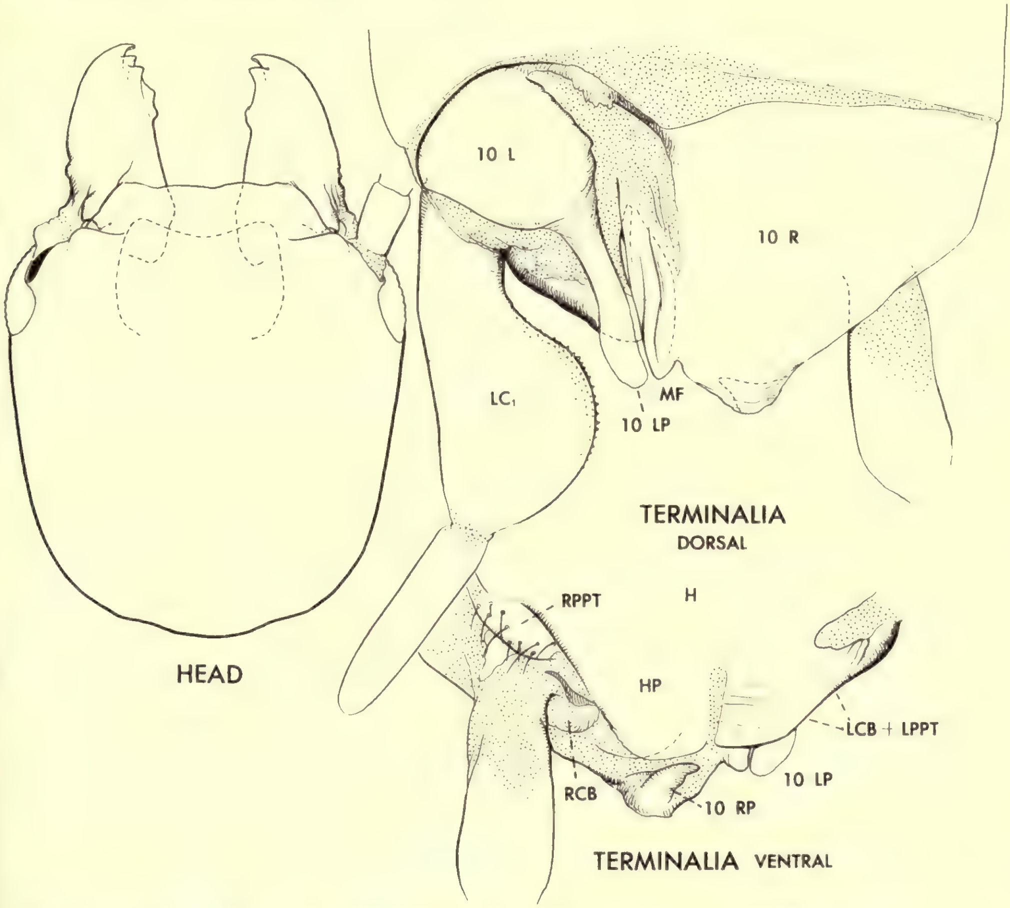

FIG. 17. *Embia lucasi* n. sp. Important characters of holotype. Explanation of symbols on page 279.

## *CLEOMIA* Stefani

*Cleomia* Stefani, 1953*b* : 93.

Type-species. *Cleomia guareschii* Stefani, 1953, by original designation.

Distribution. SARDINIA and BALEARIC ISLANDS.

Diagnosis. Males superficially indistinguishable from apterous males of *Embia*. Abdominal terminalia very distinct, as follows : left tergal process (10 LP) short, truncate with minute, acute, ventro-apical subprocess ; median flap (MF) sclerotic with apex narrowly-acute and curved mesad ; epiproct sclerite (EP) large, broad basally and curved to right beneath MF ; left paraproct (LCB + LPPT) with caudal, setose, membranous lobe very large and its process short, acute and completely ventral ; most important, the basal segment of the left cercus is complex and multilobed, as figured.

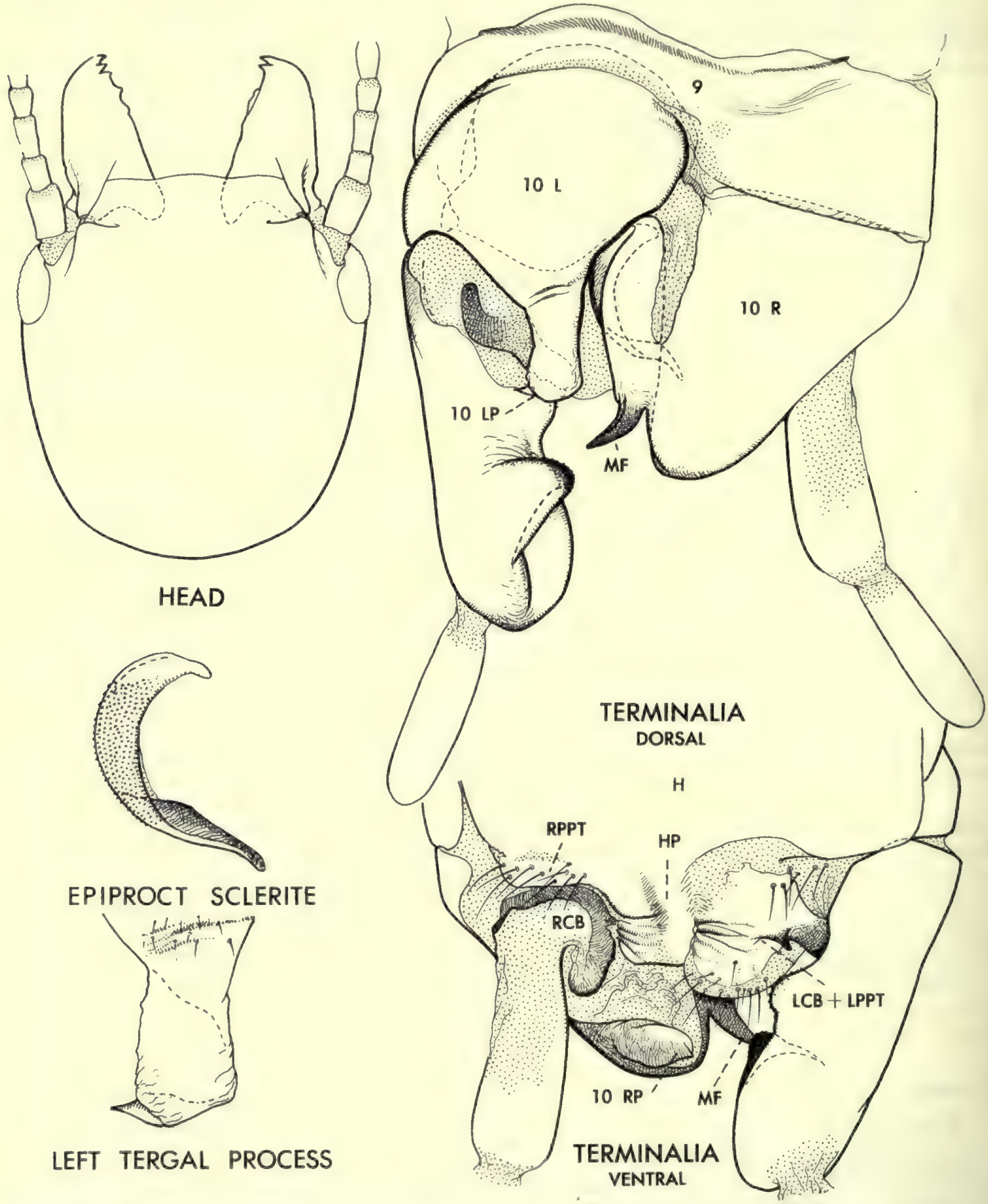
9
10 L
10 R
10 LP
MF
HEAD
TERMINALIA
DORSAL
H
RPPT
HP
RCB
LCB + LPPT
10 RP
MF
EPIPROCT SCLERITE
LEFT TERGAL PROCESS
TERMINALIA
VENTRAL

FIG. 18. *Cleomia guareschi* Stefani. Important characters of a male topoparatype. Explanation of symbols on page 279.

Nymphs and females not readily distinguished from those of *Embia*.

Remarks. Only one species of this remarkable genus is known. It seems improbable that it is confined to its recorded range and collectors should be alert to the possibility of finding it, or additional species of the genus in such places as Spain and North Africa.

### ***Cleomia guareschi*** Stefani

(Text-fig. 18)

*Cleomia guareschi* Stefani, 1953*b* : 93, fig. 4 ; 1953*c* : 213 [genitalia and copulation] ; 1953*d* : 1 [biol.] ; 1959*c* : 3 [record].

Holotype. Male, in alcohol, deposited in the Istituto di Zoologia, Universita di Cagliari, Sardinia.

Type data. Southern SARDINIA : S. Bartolomeo, Cagliari (*R. Stefani*).

Additional records. SARDINIA : Gesico (*Stefani*) ; BALEARIC ISLANDS : Mallorca (Stefani, 1959*c*).

Discussion. This species can be recognized by its generic characters and reference to Text-fig. 17. The adequate original description may be consulted for additional information.

## Family OLIGOTOMIDAE Enderlein[7]

OLIGOTOMIDAE Enderlein, 1909 : 190.

Type genus. *Oligotoma* Westwood, 1837, by original monotypy.

Distribution. Tropical and warm-temperate regions of Old World : EUROPE, MEDITERRANEAN REGION, ASIA, INDONESIA, PAPUA, AUSTRALIA. Absent in Africa south of Atlas Mountains and New World, but often represented in such regions by artificially-spread species.

The only natural occurrence of Oligotomidae within the regional scope of this paper is the peculiar genus *Haploembia* Verhoeff. An artificially-spread species of *Oligotoma* has been recorded from Israel, Egypt, and Libya.

### ***OLIGOTOMA*** Westwood[8]

*Embia* (*Oligotoma*) Westwood, 1837 : 373.
*Oligotoma* Westwood ; Burmeister, 1839 : 770.

Type-species. *Embia* (*Oligotoma*) *saundersii* Westwood, 1837, by original monotypy.

Distribution. Endemic to Indian subcontinent and possibly south-western Asia, but not south-eastern Asia. Several species have been widespread in commerce and are very abundant in the area of introduction. One of these species, *nigra*, is well established in the south-eastern Mediterranean region.

[7] Complete bibliography not included at this time.

[8] Synonymy complete. Citations incomplete.

## ***Oligotoma nigra*** Hagen[9]

(Text-fig. 19)

*Embia nigra* Hagen, 1866 : 221 [*nom. nud.*].
*Oligotoma nigra* (Hagen), 1885 : 174.
*Embia californica* Banks, 1906 : 1 [Type : Male nymph, Los Angeles, CALIFORNIA]. Davis, 1940*b* : 364 [as syn. of *nigra*].
*Oligotoma mesopotamica* Esben-Petersen, 1929 : 8 [Type : Male, Baghdad, IRAQ]. Davis, 1940*b* : 364 [as syn. of *nigra*].

Lectotype (designated by Davis, 1940*b*). Male, deposited in the Museum of Comparative Zoology, Cambridge, Massachusetts.

Type data. EGYPT : Island of Rhoda, Cairo.

Diagnosis. *O. nigra* is the only species of *Oligotoma* recorded from the Mediterranean region. It thus can easily be distinguished by generic characters. The males always are alate, rather slender in form, dark brown, and wing vein MA is unbranched. Alate males of all other species of the order in the region here covered have this vein branched. The terminalia are very similar to those of *Haploembia* but are distinct in having a sclerotic, talon-like hook on the left paraproct. All stages of *nigra* are separable from those of *Haploembia* by the absence of a second hind basitarsal ventral papilla. The inexperienced worker will have difficulty, however, separating

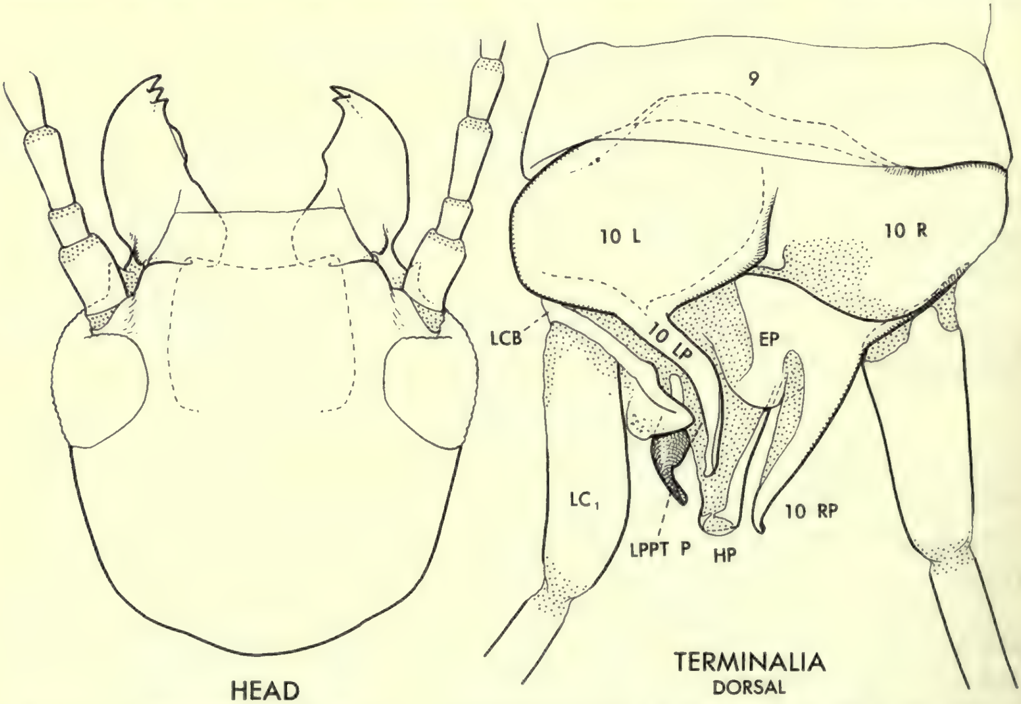

FIG. 19. *Oligotoma nigra* Hagen. Important characters of a male from Khartoum, Sudan. Explanations of symbols on page 279.

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[9] Synonymy complete. Citations incomplete.

nymphs and adult females of *nigra* from those of *Embia* because of the similar number of basitarsal papillae. However, the only species of *Embia* known to be sympatric with *nigra* is *savignyi* Westwood, which has light brown to golden adult females in contrast to the uniformly blackish brown coloration of adult females of *nigra*. *Nigra* females also are smaller and more slender in body proportions.

General distribution. Northern INDIA westward through PAKISTAN, AFGHANISTAN, IRAN, IRAQ, ARABIA, and ISRAEL to the Nile Valley and SUDAN. The most western record in the Mediterranean region is in TRIPOLI. A complex of related species, including *nigra* itself, occurs in northern India and this may be regarded as *nigra*'s region of origin. From this centre the species must have spread westward in man's ancient and modern commerce. More recently the species has become established in south-western UNITED STATES, north-western MEXICO, and arid inland regions of eastern AUSTRALIA.

Mediterranean records. EGYPT: Island of Rhoda, Cairo, (M.C.Z.); Heliopolis, 1 pair, 1.x.21 (*H. St J. B. Philby*) (B.M.N.H.); LIBYA: Tripoli, males at light (B.M.N.H.); ISRAEL: Jericho, 5 males at light, 9.ii and 9–11.vii.1929 (*J. Tapukhi*) (B.M.N.H.); Jericho, 1 male, 28.v.18 (*E. E. Austen*) (B.M.N.H.); Near Jaffa, 1 male, 2.ix.18 (*E. E. Austen*) (B.M.N.H.). The collector must expect to encounter this species almost anywhere in North Africa and the eastern Mediterranean region.

## *HAPLOEMBIA* Verhoeff[10]

*Embia* (*Haploembia*) Verhoeff, 1904: 201.
*Haploembia* Verhoeff; Enderlein, 1909: 188. Davis, 1939: 561.
*Dityle* Friederichs, 1907: 272 [type sp.: *Embia solieri* Rambur]. Davis, 1939: 561 [as syn. of *Haploembia*].
*Gynembia* Ross, 1940: 664 [type sp.: *Gynembia tarsalis* Ross]. Stefani, 1955: 114 [as syn. of *Haploembia*].

Type-species. *Embia solieri* Rambur, 1842, by original monotypy.

Distribution. MEDITERRANEAN and BLACK SEA regions. Parthenogenetic form of type-species introduced into CANARY ISLANDS, MADEIRA, and S.W. UNITED STATES.

Diagnosis. Nymphs and adults distinct from all other Recent species occurring within geographic scope of this paper in the possession of two instead of one hind basitarsal papillae. Males always apterous; head gross, eyes small; mandibles very elongate and tapered distad, apices extending well beyond labral margins, bases broad and often dorsally carinate; submentum broader than long, sclerotic, margins inflexed. Terminalia as in *Oligotoma*, with tenth hemitergites basally fused; left process (10 LP) narrow, twisted; right process (10 RP) acutely-triangulate; epiproct (EP) large, fully exposed. Left paraproct (LPPT) fused to left side of hypandrium process (HP), thickened caudally but not developed as a distinct process. Left cercus-basipodite not forming a complete ring or mesally-lobed. Basal segment of left cercus enlarged but not developing a distinct lobe, surface devoid of echinulations.

Females: Similar to most *Embia* females but paler, lacking sclerotization in genitalic region, and possessing a second hind basitarsal papilla.

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[10] Synonymy complete, citations incomplete.

Remarks. *Haploembia* males show a high degree of neoteny, which must constitute an adaptation to the long summer dry season prevalent in its range, which is ecologically marginal for the order. One species, *solieri*, has been widely dispersed in man's Mediterranean commerce and it would be difficult to determine the region of origin for the species. The recent discovery of so striking a species as *palaui*

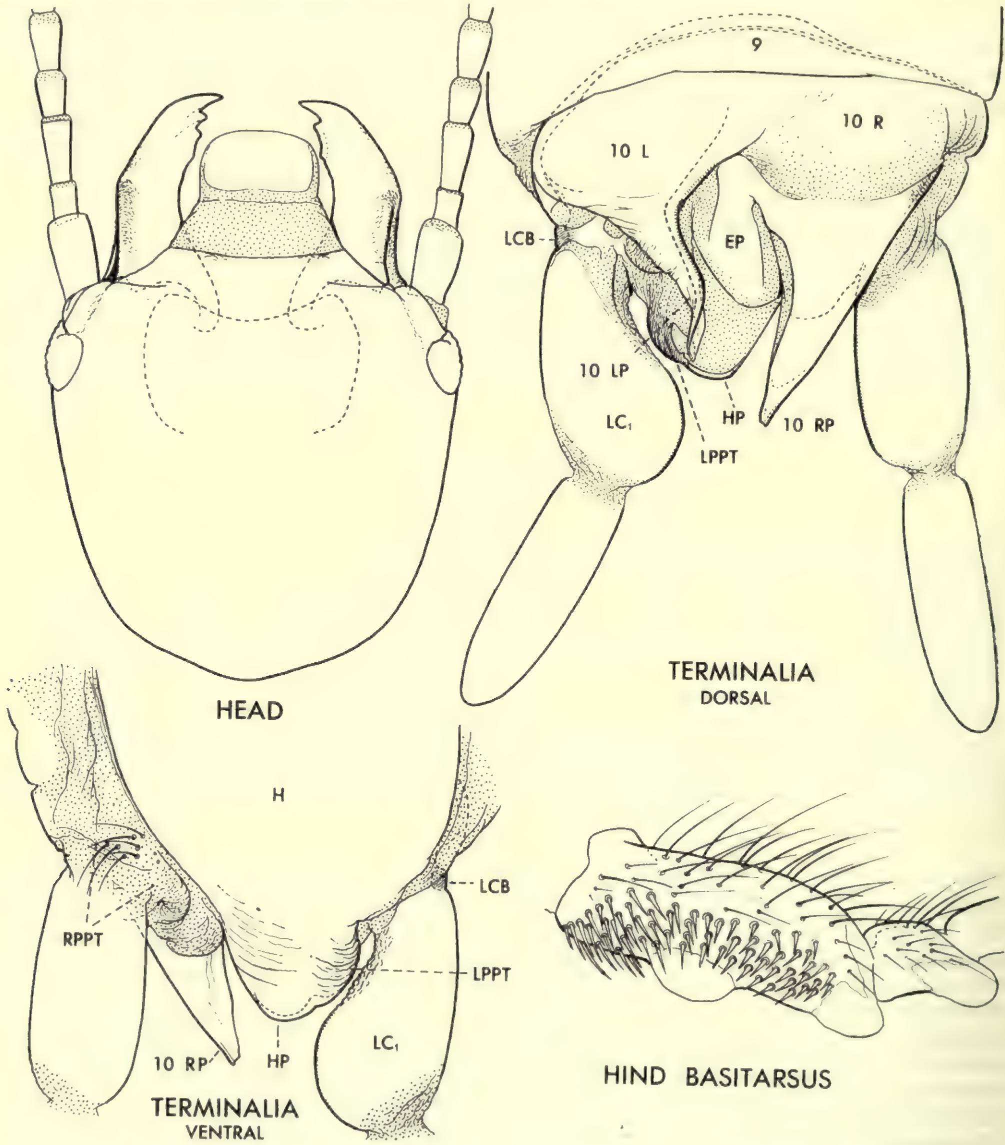
HEAD
9
10 R
10 L
LCB
EP
10 LP
LC$_1$
HP
10 RP
LPPT
TERMINALIA
DORSAL
H
RPPT
LCB
LPPT
LC$_1$
10 RP
HP
TERMINALIA
VENTRAL
HIND BASITARSUS

FIG. 20. *Haploembia solieri* (Rambur). Important characters of a male topotype. Explanation of symbols on page 279.

Stefani (1953) in the western Mediterranean region indicates a possibility that additional species will be discovered as more remote regions of the circum-Mediterranean area are thoroughly collected.

A number of unrelated species of the order from diverse regions of the world have been assigned to the genus but these have been removed and the well-defined concept is limited to the three species which can be identified by use of the following key :

### Key to Species of Haploembia (Males)[11]

1 Very large (body length greater than 15 mm.); prothorax and legs as dark as remainder of insect . . . . . . . . . . . . . 2
– Smaller (body length less than 13 mm.); prothorax yellowish, paler than remainder of insect . . . . . . . . . . . . . . ***solieri***
2 Mandibles with baso-lateral margins elevated, carinate; left paraproct with caudal lobe simple . . . . . . . . . . . . . . ***palaui***
– Mandibles with baso-lateral margins not elevated; lobe of left paraproct very large and bilobed . . . . . . . . . . . . ***megacephala***

## ***Haploembia solieri*** (Rambur)

(Text-fig. 20)

*Embia solieri* Rambur, 1842 : 313. Walker, 1853 : 531. Brauer and Loew, 1857 : 34. Hagen, 1866 : 283. McLachlan, 1877 : 376. Girard, 1879 : 296. Lucas, 1880 : 97. Girard, 1881 : 136. Lucas, 1882 : 185 ; 1883 : 26. Hagen, 1885 : 193. Grassi, 1889 : 6. Saussure, 1896 : 340. Grassi and Sandias, 1897–98 : 39. Navás, 1900 : 8. Enderlein, 1903 : 430. Legér, 1904 : 365. Rimsky-Korsakov, 1905 : 432. Jakobson-Bianki, 1905 : 501. Friederichs, 1906 : 218. Navás, 1908 : 49. Kusnezov, 1910 : 223. Rimsky-Korsakov, 1910 : 153.

*Haploembia solieri* (Rambur) ; Verhoeff, 1904 : 201. Enderlein, 1909 : 188. Krauss, 1911 : 50, figs. Rimsky-Korsakov, 1912*a* : 17 ; 1912*b* : 610. Enderlein, 1912 : 67, fig. 39. Schulze, 1915 : 40. Navás, 1918 : 80 [Majorca record]. Friederichs, 1923 : 11 ; 1934 : 409. Taborsky, 1938 : 110. Davis, 1939*a* : 561, figs. 1–4. Delamare Debouteville, 1946 : 201, figs. Stefani, 1953*b* : 84 ; 1953*c* : 210 [copulation, genital organs], fig. 1 ; 1953*d* : 7 [cannibalism] ; 1954 : 121 [parthenogenesis] ; 1955 : 110, fig. 1 [systematics] ; 1956*a* : 169 [parthenogenesis] ; 1956*b* : 127 [parthenogenesis]. Michieli, 1956 : 90. Ross, 1957 : 51, figs. [California]. Gilyarov, 1957 : 95. Michieli 1958 : 525. Stefani, 1959*a* : 622 [parthenogenesis] ; 1959*b* : 1 [parthenogenesis] ; 1959*c* : 3 [key] ; 1959*d* : 105 [parasitism and parthenogenesis] ; 1960*a* : 87 [parasitism] ; 1960*b* : 110 [records] ; 1960*c* : 277 [parasitism and parthenogenesis] ; 1961 : 36 [systematics].

*Embia* (*Dityle*) *solieri* (Rambur) ; Friederichs, 1907 : 272.

*Embia taurica* Kusnezov, 1903 : 208 [Type locality : Crimea] ; 1904 : 138. Redikorzew, 1908 : 83 [eye].

*Embia* (*Dityle*) *taurica* Kusnezov ; Friederichs, 1907 : 271.

*Haploembia taurica* (Kusnezov) ; Krauss, 1911 : 53. Enderlein, 1912 : 68, 102. Taborsky, 1938 : 122. Davis, 1939*a* : 562. Stefani, 1953 : 113 [as syn. of *solieri*].

*Embia grassii* Friederichs, 1906 : 227 [Type locality : Sicily, probably Catania, no desig. type]. Davis, 1939 : 561 [as syn. of *solieri*].

*Dityle grassii* (Friederichs), 1907 : 270.

*Embia* (*Dityle*) *grassii* Friederichs ; Krauss, 1911 : 51 [as syn. of *solieri*].

*Embia* (*Haploembia*) *grassii* Friederichs ; Stefani, 1955 : 114 [as syn. of *solieri*].

[11] *H. solieri* has a parthenogenetic form which cannot be keyed out at present. Its nymphs and females should be smaller and more pale, yellow-brown than those of *palaui* and *megacephala*. The latter is known only from its holotype.

*Haploembia grassii* (Friederichs) ; Enderlein, 1912 : 69. Taborsky, 1938 : 113, figs.

*Embia cephalotes* Navás, 1908 : 50 [Type locality : Spain : " Orihuela (Alicante)," types lost?]. Enderlein, 1912 : 67 [as syn. of *solieri*]. Navás, 1918 : 359 [as syn. of *solieri*]. Davis, 1939*a* : 565 [as prob. syn. of *Embia ramburi*]. Stefani, 1955 : 118 [as prob. syn. of *solieri*].

*Haploembia codinai* Navás, 1922 : 126 [Type locality : Morocco : Ceuta, male in Barcelona Mus.]. Davis, 1939*a* : 565 [as syn. *E. ramburi*?]. Stefani, 1955 : 114 [as syn. of *solieri*].

*Gynembia tarsalis* Ross, 1940 : 664 [Type locality : Clayton, California, female in Calif. Acad. Sci.]. 1944 : 496. Stefani, 1955 : 114 [as syn. of *solieri*]. Ross, 1957 : 56 [as syn. of *solieri*].

Type. Juvenile specimen, sex undeterminable, deposited in the Institut Royal des Sciences Naturelles de Belgique, Bruxelles.

Type labels. FRANCE : " Marseille " (on gold card), " Embia Solieri Ramb," " Haploembia Solieri Ramb. Type ♀ det. Enderlein," " Coll. Selys," " Type " (red card). The first two labels appear to be in Rambur's hand ; the others were added later by other persons.

Remarks. I have examined the above type specimen and found it to be a small nymph (sex undeterminable) lacking its head, prothorax and all appendages. Therefore, there is no basis for confirming or disputing its identity. However, the current use of the name is well established and the identification of the species may be considered settled.

We are indebted to Stefani (1955) for confirming the synonymy of *taurica* and *grassi* by reference to topotypic male specimens. Stefani also suppressed *codinai* of Ceuta, Morocco by examination of the holotype. The synonymy of *cephalotes* is not quite settled and will depend on an elucidation of the Embioptera fauna occurring at the type locality : Orihuela (Alicante), Spain. There remains the possibility that *cephalotes* is a synonym of *palaui* Stefani which is here reported from south-eastern Spain, or that it is a species of *Embia*.

The name *Gynembia tarsalis* Ross was proposed at a time when the parthenogenetic form of *solieri* was as yet unknown in Europe. Although *Gynembia* is clearly a synonym of *Haploembia*, the species name *tarsalis* remains available if ever the parthenogenetic form is regarded as a subspecies of *solieri*, or a distinct species.

The following brief description and associated figures are based on a male from Villefranche, near Nice, France.

Male. Appearance : Apterous with large head and small terminalia, generally dark brown with yellow-brown prothorax and legs. Colour details (in alcohol) : Cranium dark chestnut-brown with faint pattern in the somewhat paler caudal region ; gula and margins of occiptial foramen golden brown. Eyes black, surrounded by narrow pale ring. Antennal segments I and II concolorous with cranium, all other segments tan with reddish brown apices. Anteclypeal membrane purple-white. Labrum dark chestnut-brown. Mandibles amber, dorso-basal flanges and dentation piceous ; submentum light chestnut-brown, other sclerotized mouthparts golden tan ; basal segments of labial palpi medium brown. Prothorax and its legs amber with rust-red mottling. Meso- and metathorax and abdomen dark reddish brown with slight metallic lustre, membranes dark purple ; meso- and metathoracic legs yellow-brown ; with hind femora medium brown. Abdominal terminalia and cerci medium brown with ferrugineous mottling. Dimensions : body length 11·5 mm. Important structural features as figured.

General distribution. *Old World :* Coastal regions of PORTUGAL, CANARY ISLANDS, MADEIRA, SPAIN, MOROCCO, southern FRANCE, ITALY, islands of Tyrrhenian Sea, YUGOSLAVIA, ALBANIA, GREECE, CRETE, BULGARIA, southern RUSSIA, TURKEY, and EGYPT. *New World* (by introduction) : CALIFORNIA, ARIZONA, and TEXAS.

It is probable that *solieri* is as yet unrecorded from other Mediterranean regions, such as North Africa and the eastern Mediterranean littoral. The species range must have been artificially extended in man's ancient and modern commerce and thus it may be difficult to determine its region of endemicity, or origin.

New records. PORTUGAL : Casores, 4.vi.41, nymphs, (*Wygodzinsky*) (C.A.S.) ; Amadora (near Lisbon), 10.vi.49, 2 females (*Luna de Carvalho*) (C.A.S.). CANARY ISLANDS, nymphs, (*B. Malkin*) (C.A.S.). MADEIRA : Norto Santo ii.63, nymphs, (*R. W. J. Uffen*) (C.A.S.). EGYPT : Minshat el Ikwa, Aga, Daqahliya Prov., 13.xi.53, nymph (*H. Hoogstraal*), deep in nest of *Arvicanthus* sp. (C.A.S.). GREECE : Athens (*Pascoe*), adult ♂ (McLachlan Coll., B.M.N.H.). ITALY : S. Basilia Mottola (Toronto), 1.vi.09 (*Andreini*) (Genoa Mus.) ; Nicolosi, Mt Rossi, x.25 (*Dudich*) (Budapest Mus.). CRETE : Resurgence D'Almuros, nr. Condia, adult ♀, under stone (*K. Lindberg*) ; Mt Ida, Antro Javis 1200–1500, adult ♂, (*Biró*) (Budapest Mus.) ; Ins. Dhia, 1906, 25.v.29, adult ♂ (*Biró*) (Budapest Mus.). SPAIN : Nr. Grazalema, 2,500 ft., 29.vii.25, cork oak woods (*W. M. Wheeler*) (M.C.Z.). TURKEY : adult ♂ in plant quarantine at New York in cargo from Turkey (U.S.N.M.).

Parthenogenetic form. Curiously, certain islands of the western Mediterranean Sea are populated by a form of *Haploembia* which reproduces exclusively by parthenogenesis. To date no males have been found within its range and the females will not mate with males of *solieri* when the opportunity is artificially afforded in laboratory cultures. Although consistent small coloration and structural differences exist (Stefani & Contini, 1961) between this parthenogenetic form and the usually bisexual form of *solieri*, which occurs elsewhere (" forma anfigonica " of Stefani), it is not regarded as specifically, or even racially, distinct from typical *solieri*.

According to Stefani & Contini, the bisexual form, or typical *solieri*, has females with generally darker pigmentation of sclerites and membranes ; the micro-sculpture of the lower, longitudinal depression of the hypopharynx is finer ; the lacinia have distinct form and setation ; the egg has a shorter form with a thicker rim to the operculum. There also are differences in oviposition, maturation of eggs, chromosomes, and resistance to parasitism by *Diplocystis clerci*.

Stefani (1959, 1960) noted that *Diplocystis* parasitism may cause male sterility and, inasmuch as there is a great range or percentage of rudimentary and accidental parthenogenesis in bisexual populations of *solieri*, parasitism gradually might foster reproduction of the species without the necessity of males. Such " accidental parthenogenesis " may become constant on islands where the genetic stock is more limited and cut off from the chances of repopulation of the region with bi-sexual stocks surviving in contiguous territory.

Distribution of parthenogenetic form. Islands of Tyrrhenian Sea : CORSICA, SARDINIA, ELBA, GIGLIO, ARGENTARIO, CAPRI. Atlantic islands : CANARY ISLANDS, MADEIRA. New World : CALIFORNIA, ARIZONA, S.W. TEXAS.

It is probable that the Mediterranean distribution of parthenogenetic *solieri* has been artificially increased by man. Certainly its occurrence on certain Atlantic islands and in the New World must have resulted from a spread in commerce. Formerly (1940, 1944), I considered the possibility that the New World distribution was relict, a remnant of a natural, ancient Holarctic distribution. I have since abandoned this theory in favour of the idea that the species was carried in cargo and ballast of early Spanish sailing ships, which regularly stopped in the Canary Islands en route to colonies in the Americas. It is surprising, however, that the Mediterranean life zone of central Chile did not receive *solieri* by this means inasmuch as Valparaiso must have been a regular stopping point during voyages to California.

*Haploembi solieri* has become the subject of much cytological research and the reader interested in this field should consult numerous works (not here cited) published by Dr. Renzo Stefani of Cagliari, Sardinia.

## ***Haploembia megacephala*** Krauss

*Haploembia megacephala* Krauss, 1911 : 53, figs. Enderlein, 1912 : 101, fig. [after Krauss]. Davis, 1939*a* : 562, figs. [after Krauss]. Stefani, 1955 : 114, fig. 2 [redesc. type].

Holotype. Male, in alcohol, deposited in the Naturhistorische Museum, Vienna.

Type labels. " Plason 72. Syrien." " Dictyoploca (Embia) megacephala Krauss Type! Syrien." I assume that " Plason 72 " in the first label represents the name of the collector and the year 1872. The second label is in Krauss' handwriting.

The following is my redescription of this type :

Appearance : Large, robust, apterous, with large head and small terminalia ; general colour medium brown with a pale band between each thoracic segment, head golden brown. Colour details (in alcohol) :[12] Cranium dorsally and ventrally golden brown with pattern obsolete Eyes black. Basal antennal segment pale straw-yellow, other segments cream-white to apex. Clypeo-labral membranes whitish ; labral sclerite golden brown ; mandibles concolorous with cranium at outer base, thence blending to straw-yellow, dentations reddish amber ; other mouthparts pale tan, submentum golden amber. Pronotum cream-white anterior to transverse sulcus, blending to rust-brown behind ; cervical sclerites cream-yellow ; prosternum rust-brown, all surrounding membranes cream-white. First acrotergite, adjacent membranes, and spinasternum cream-white. Mesonotum rust-brown with faint, paler maculation ; postnotum, anterior margin of metanotum, and lateral membranes cream-white ; meso- and metathoracic pleurites and sternites rust-brown, their whitish surrounding membranes tinged with pale greyish lavender. All legs uniformly golden brown. Abdominal terga I through IX uniformly rust-brown, pleural membranes pale greyish lavender ; sternites golden tan ; left hemitergite and base of its process reddish brown, apex of process becoming pale amber ; right hemitergite rust-tan, inner margin reddish amber, caudal process straw-yellow ; hypandrium golden tan darker at sides ; dorsal lobe of left paraproct golden amber ; cerci entirely rust-tan. Dimensions (in alcohol) : body length (including head) 16·25 mm., head length (clypeal margin caudad) 3·0 mm.

Important structural features : Cranium very large in proportion to body, oval ; sides evenly arcuate and narrowly rounded behind ; anterior tentorial pits with sclerotic posterior carinae extended mesad and meeting to form a shallow V ; clypeus very short and slanted ventrad ; anterior margin curving laterad to tentorial pits lateral clypeal margins thus absent. Labrum laterally membranous, i.e., the sclerite not occupying full width of labrum as in *palaui*. Mandibles exceptionally narrow and long (extending well beyond labral margin) ; apical tooth of each mandible large, subapical teeth reduced to a small rudiment on each mandible; dorsobasal carina, so prominent in *palaui*, obsolete or absent. Submentum very large and broad; sides evenly arcuate; anterior margin broadly, evenly, inwardly arcuate; outer-apical angles acute. Body, legs, and terminalia very similar to *palaui* except, as follows: left tergal process more irregular in shape, abruptly bent downward at base then sharply bent to the right, thence straight until apical twist to the left; apical lobe of left process very large, elevated; shaped like a grape seed, obscuring tip of left process; left cercus very narrow at base, inner margin at first concave then gradually expanded to form a large, evenly-rounded, subapical lobe.

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[12] One may expect that the colour tones are consistently pale due to long preservation in alcohol.

Female. Unknown.

Remarks. This species is known only from the unique type. It is most closely related to *palaui* Stefani, but differs in several characters, especially in its reduced mandibular carinae and in the much larger and bilobed dorsal lobe of the left paraproct. Davis, on the basis of Krauss' misleading illustration, erroneously regarded the left paraproct lobe as a development of the left tergal process which it overlaps.

## ***Haploembia palaui*** Stefani

*Haploembia palaui* Stefani, 1955 : 116, fig. 3; 1959*a* : 622 [parthenogenesis]; 1959*b* : 6 [parthenogenesis]; 1959*c* : 3 [key].

Holotype. Male, in alcohol, deposited in the Instituto di Zoologia, Universita di Cagliari, Sardinia.

Type data. " Palma de Mallorca (Baleari) leg. J. M. Palau."

Remarks. Stefani has adequately described and figured this species. Its range may overlap that of *solieri* but *palaui* can readily be separated by its much larger size, its more uniformly dark coloration (*solieri* has the prothorax and legs pale), and its greatly elevated mandibular carinae. Actually, *palaui* is most closely related to *megacephala*, occurring at the opposite end of the Mediterranean Sea. *Megacephala* is distinguished by its reduced mandibular carinae and greater lobing of the left paraproct.

Recorded distribution. Palma de Mallorca. Greek Archipelago: Ktenia (rock) east island of Nasso (O. Wettstein) (one ♂ Vienna Mus.).

The above records suggest that *palaui* had been carried about in man's Mediterranean commerce. A thorough embiid survey of the circum-Mediterranean region, especially of eastern regions, will be required to understand the *palaui-megacephala* complex. It is possible that differences between the two " species " have resulted from centuries of inbreeding of the progeny of a limited number of parents introduced on to a particular island or into a particular region.

New Records: SPAIN: " La Cañada (Almería) vi.1942 Zarco " 2 males (Madrid Mus.); " Mazarrón " (west of Cartagena in Murcia) 2 males (Madrid Mus.).

The above records indicate that we may expect to find *palaui* in many other coastal regions of Spain and perhaps in North Africa as well.

The two males from La Cañada and one from Mazarrón have more than half of the anterior portion of the cranium golden with golden streaks extending into the caudal brown area. The other specimen from Mazarrón has a uniformly brown cranium. The Spanish specimens differ from my topotypic specimen of *palaui* in having much less pronounced carination or longitudinal elevation of the mandibles and there are consistent differences in the form of the cranium and submentum. When the *palaui-megacephala* complex is more adequately sampled and studied the importance of such variation will be better understood. For the present it is best to identify these Spanish specimens as *palaui*.

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# CONTRIBUTIONS TOWARDS A REVISION OF *MYRSIDEA* WATERSTON. I. (MENOPONIDAE : MALLOPHAGA)

T. CLAY

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
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BY

T. CLAY

British Museum (Natural History)

*Pp.* 327–395 ; *2 Plates, 78 Text-figures*

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# CONTRIBUTIONS TOWARDS A REVISION OF *MYRSIDEA* WATERSTON (MENOPONIDAE : MALLOPHAGA) I.

*By* T. CLAY

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## SYNOPSIS

In this part the genus *Myrsidea* as a whole and the characters of taxonomic importance for the separation of species and species groups are discussed. Previous attempts to subdivide the genus are considered. The species parasitic on the avian subfamily Turdinae are revised, fifteen known species being re-described and five new species described. There is a key to the species groups and a list of hosts and parasites.

## INTRODUCTION

*Myrsidea* comprises a large number of species parasitic on the Passeriformes, Ramphastidae, Capitonidae and Trogonidae. Although the species are diverse and show many distinguishing characters, this genus has suffered as badly as any of the genera of Mallophaga from inadequate descriptions so that many of the species, even those in recent publications, are unrecognizable. For this reason it is impossible to revise the known species or to describe new ones without examining the types. I have been fortunate through the kind assistance of many individuals and institutions in being able to see the majority of types still in existence and specimens from the type hosts of many of the species of which the types are lost or never existed.

## *MYRSIDEA* Waterston, 1915

*Myrsidea* Waterston, 1915 : 12. Type-species : *M. victrix* Waterston.
*Acolpocephalum* Ewing, 1927 : 88. Type-species : *A. brevipes* Ewing.
*Australmenopon* Conci, 1942 : 30. Type-species : *Menopon cinerea* Thompson. **syn. n**
*Allomyrsidea* Conci, 1942 : 31. Type-species : *Myrsidea struthidea* Thompson.
*Corvomenopon* Conci, 1942 : 31. Type-species : *Menopon robsoni* Cummings.
*Ramphasticola* Carriker, 1949 : 305. Type-species : *R. hirsuta* Carriker.
*Alcediniphilus* Ansari, 1951 : 189 (s.g.). Type species : *Myrsidea* (*Alcediniphilus*) *kuluensis* Ansari. **syn. n.**
*Myrsidella* Eichler, 1951 : 49. Type-species : *Myrsidea consimilis* (Piaget), *sens.* Eichler.
*Densidea* Zlotorzycka, 1964 : 171. Type-species : *Myrsidea rustica* (Giebel). **syn. n.**
*Vulgidea* Zlotorzycka, 1964 : 172. Type-species : *Myrsidea cucullaris* (Nitzsch). **syn. n.**
*Liquidea* Zlotorzycka, 1964 : 173. Type-species : *L. proterva* Zlotorzycka. **syn. n.**
*Lanimenopon* Zlotorzycka, 1964 : 177. Type-species : *L. abhorrens* Zlotorzycka. **syn. n.**
*Eichlerinopon* Zlotorzycka, 1964 : 179. Type-species : *E. celeripes* Zlotorzycka. **syn. n.**
*Neomyrsidella* Zlotorzycka, 1964 : 182. Type-species : *N. usitata* Zlotorzycka. **syn. n.**

Menoponidae without notch or slit in the dorso-lateral margins of the head ; without sclerotized processes ("oral spines") arising near base of maxillary palpi; head sensilli 3–5 (Clay, 1961 : 575) apparently absent; outer mid-dorsal head setae and posterior dorsal setae (e) absent (Clay, 1962, fig. 4. d.e.) ; gular plate characteristic (Text-fig. 1). Pronotum without the two dorsal setae lying on or near the transverse carina (Clay, 1962, fig. 4, dps. 1 and 2) ; posterior margin of pronotum with six or more long setae ; prosternal plate well developed with two anterior setae. Mesothorax with notum, pleura and sternum fused to form a strongly sclerotized ring round the body (Pl. I, fig. 6) ; mesonotum well defined with only two anterior setae (Clay, 1961 : 573, fig. 3 and Text-fig. 3, a.) ; mesosterum heavily sclerotized, with 2 + 2 setae. Femur III without combs of spine-like setae but with thick or sparse brushes of setae.

Other characters which may prove of generic value are the greater length and thickness of the posterior pair of gular setae compared to the rest; the small size of

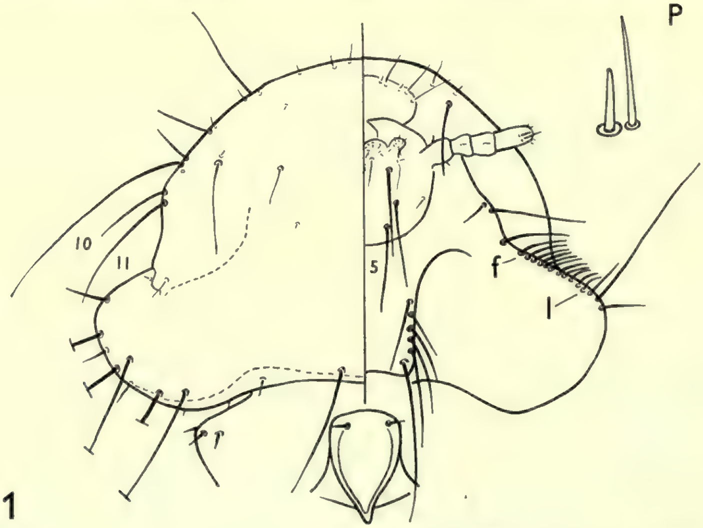

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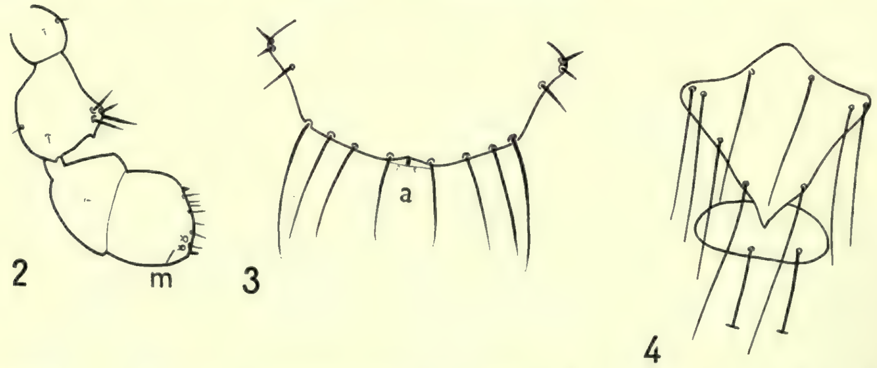
FIG. 1. *Myrsidea thoracica.* ♂ head and prosternal plate. f, first seta and l, last seta of latero-ventral head fringe ; P, dorsal pair of setae on last segment of maxillary palp.

the outer occipital setae compared to the long stout inner pair and the empodium (Kéler, 1952 : 575, fig. 3). This last structure, found on tibia II and III is fan-shaped (Text-fig. 8). It is possible that the form of the empodium may form a generic character in the Menoponidae ; unfortunately it is a delicate structure and is usually shrivelled in mounted specimens. The euplantula (Kéler, 1952 : 576, fig. 6) found on the first tarsal segment with two hyaline spine-like setae is similar to that figured by Kéler and probably shows little difference throughout the Menoponidae. While the aster of spine-like setae or group of long setae at each postero-lateral corner of sternite II is found in most species this may be entirely absent, being replaced by evenly spaced stout setae on the posterior margin as in some species of *Menacanthus*, for instance. *Myrsidea* is a most distinctive genus, the strongly sclerotized ring-like mesothorax and the presence of only two anterior mesothoracic setae being unusual characters in the Menoponidae ; these two features together with the characters of the lateral margin and setae of the head separate it from all other genera. Until more is known about which of the characters of this genus are likely to be of phylogenetic importance it is perhaps wiser not to postulate its possible affinities.

In the majority of species the females show some modifications of the abdominal terga and less commonly of the meso- or metanotum ; these range from slight convexity of the posterior margin of two or three of the anterior tergites of the abdomen as in *M. incerta* (Text-fig. 30) to the extreme cases as in *M. buxtoni* Waterston in which tergite I is absent and II reduced to a small sclerite each side of the body. Thus, in some groups the females are markedly different, while the males can only be separated with difficulty or not at all. There is no obvious explanation why *Myrsidea* should have this tendency in the female to modification of the metanotum and abdominal terga, unknown to this extent anywhere else among the Menoponidae. It would seem to have little functional advantage as far as the environment is concerned as the two sexes are found on the same feathers and species in which the females have the abdomen little or greatly modified may be found on the same host (*M. obovata* (Piaget) and *M. sjoestedti* (Kellogg) on *Corvus albus*). It might however prevent cross breeding between closely related forms in a genus in which secondary infestations may have been common, and thus prevent wasteful hybridization (Clay, 1949 : 290).

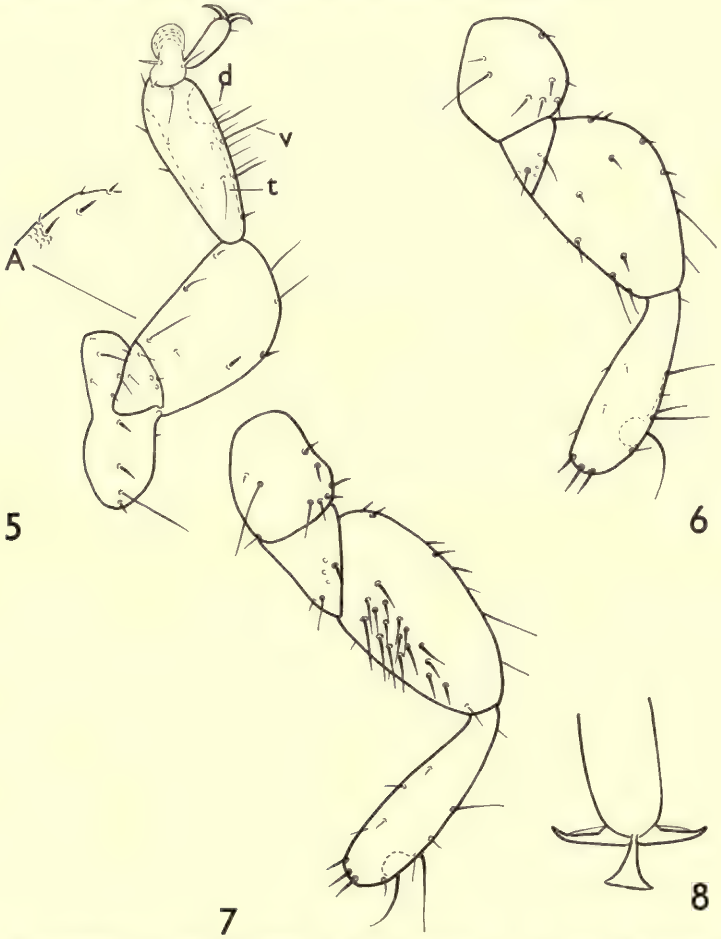
These modifications of the female abdomen appear to be of little phylogenetic importance (Clay & Hopkins, 1960 : 48) and other characters must be found by which related species can be grouped. As discussed elsewhere (Clay, 1962 : 194 and 1951 : 173) it seems reasonable to consider the characters common to populations from related hosts as ones of possible phylogenetic value, especially if these are characters which do not appear to be directly adaptive to the environment. Species of *Myrsidea* grouped together on the characters of the male genital sclerite are frequently found to be parasitic on a group of related hosts. For instance, all the species from the Hirundinidae have a characteristic sclerite (Pl. I, fig. 2) and also resemble each other in the shape of the head, the division of the mesonotum and the presence of two long, one medium and one short setae on pleurite VIII. However, in the female these characters are not always sufficient to distinguish the species from those occurring on other host families. Many of the species on the Corvidae have a characteristic male genital sclerite (Pl. I, fig. 3) and this is frequently associated in both sexes with eight or more setae on the posterior pronotal margin, with at least one long seta on the metapleurite, with two long and one short setae on pleurite VIII and at least one long seta on pleurite VII. Some species from the Corvidae with the typical genital sclerite do not have the other characters so that females may not be identifiable as belonging to the group. Males from the Laniidae have the genital sclerite and the eight or more long pronotal marginal setae as in the species parasitic on some of the Corvidae. Examples of other groups identifiable by the male sclerite are the *thoracica* group (see below) and the species from the Icteridae. Thus, while most species are more easily identified in the females, the males may show the characters necessary for phylogenetic grouping. Males and females of a species may have few characters in common and only one sex may be identifiable, it is therefore unsatisfactory to describe new species based on only one sex.

Attempts have been made to subdivide the genus: *Acolpocephalum* was erected for a nymph of *Myrsidea*. *Australmenopon* was erroneously placed in *Austromenopon* by Hopkins & Clay (1952 : 44) who had seen only the original descriptions and figures of *Menopon cinerea*; however a single male of this or a similar species from *Corcorax* shows that it has the characters of *Myrsidea* listed above and can be included in that genus. *Allomyrsidea* was based on the original description of *M. struthidea*, the male genitalia of which are unlike any other, but this character alone is rarely useful for generic separation. *Corvomenopon* was based on the female of a single species, *M. robsoni*, the characters used for separation being the modifications of the thorax and the dorsal chaetotaxy. However, as already shown these secondary sexual characters are not satisfactory for generic separation and result in genera in which the males are not generically identifiable. *Myrsidella* was based on a single female from *Corvus cornix* identified by Eichler as *M. consimilis* (Piaget), but which from the figure of part of sternite II was probably *M. isostoma* (Nitzsch) from *Corvus frugilegus*. This species has a group of elongated setae instead of a typical aster of



FIGS. 2–4. 2. *M. abidae*. ♂ antenna. m, the two mushroom-like sensillae. 3. *M. carrikeri*. ♂ pronotum. a, minute anterior mesothoracic setae. 4. *M. sultanpurensis*. ♀ metasternal plate and sternite I.

spine-like setae at each postero-lateral corner of sternite II ; otherwise it has the characters typical of the corvine-infesting *Myrsidea* and there seems to be no advantage in separating it generically. *Ramphasticola* Carriker was erected for a group of species from the Ramphastidae in which the mesothorax of the females is greatly enlarged ; in the males it is normal ; the chaetotaxy of sternite II and the female mesothorax are similar to some of the species from the Corvidae. This is another group based on the secondary sexual characters of the females and its generic recognition seems unnecessary. It is difficult to know what to say about the erection of six new genera for species of European *Myrsidea* (see Zlotorzycka, 1964) except it is unfortunate that the author published these when knowing so little about the characters of so few species of the genus and having so few specimens, the hosts of which in some cases are obviously incorrect (see note p. 388).



FIGS. 5–8. *M. thoracica*. 5–7. ♂ legs. 5. First, ventral. A, part of anterior margin of femur, dorsal ; d, first outer dorso-lateral tibial seta ; v, second outer ventro-lateral tibial seta ; t, postero-ventral tibial seta. 6. Second and 7. third leg, ventral, tarsus omitted. 8. Empodium of third leg of nymph from *Turdus merula*.

## CHARACTERS OF TAXONOMIC IMPORTANCE

The following characters have been found useful in separating species : 1. Shape of head ; this is liable to distortion in mounting, especially the shape of the anterior margin. 2. Degree of reduction of hypopharynx. 3. Head setae : number in latero-ventral fringe and on temples ; length of labial seta 5 (Text-fig. 1) ; ratio of length of seta 10 to 11* ; number of gular setae*. 4. Shape of prosternal plate. 5. Number of long setae on posterior margin of the pronotum. 6. Presence or absence of a median division in the mesonotum. 7. Length and number of metapleural setae*. 8. Shape of metasternal plate and the number of metasternal setae*. 9. Number of outer lateral ventral and dorsal* setae of first tibia (Text-fig. 5). 10. Number of setae in femoral brush*. 11. Length* and thickness* of post-spiracular setae. 12. Number and length of metanotal and abdominal tergo-central setae, especially those of VII–VIII*, and of pleurite VIII*. 13. Presence or absence of setae on sternite I. 14. Form of sternite II and thickness, number* and lengths* of the setae at the postero-lateral corners. 15. Presence or absence of anterior setae on pleurites and centrally on tergites and on sternites III–VII (♀) and III–VIII (♂). 16. Form of thorax and abdominal terga in female. 17. Form of spermatheca and sculpturing of genital chamber. 18. Number* and form of setae on vulval margin and in anal fringe. 19. Number of internal anal setae of male. 20. The male genitalia : these may differ in the shape of the endomeral plate and parameres, but both these structures are constant in large groups of species and the most useful character, as already emphasised (Clay & Hopkins, 1960 : 50), is the form of the sclerite in the genital sac.

These characters are the minimum which should be given in the description of new species ; there are probably others which may prove useful and in addition there are the more obvious ones found in the occasional species such as groups of setae in unusual positions, as on the thoracic nota of *M. robsoni* or the presence of irregular pigmented patches between some of the tergites in *M. ishizawai*.

## VARIATION

Many of the characters listed above (marked with *) show variation and cannot be used alone to distinguish species, if only a few specimens are available. As in other species of Menoponidae, size and range of the number of setae may be constant for a number of specimens, with the occasional one being quite atypical : in species of *Myrsidea* for instance, where the number of tergo-central setae of VII or VIII is usually 2 + 2, one specimen may have 2 + 4, or where the total number is 7 or more, one specimen may have 2 + 2 ; this makes identication of some of the males difficult. The three anterior spine-like setae usually found each side of the pronotum show variation in length in the *Myrsidea* species from the Turdinae : for example the most posterior of these varies in the male from 0·024–0·032 mm. (*thoracica*), 0·018–0·024 (*incerta*), 0·024–0·040 (*carrikeri*) 0·036–0·050 (*antiqua*), 0·040–0·052 (*elegans*) and in the female : 0·024–0·032 (*incerta*), 0·028–0·048 (*simplex*) ; in one female of *simplex* this seta on one side measures 0·028 and on the other 0·036 mm. The lengths of the setae in the aster, which have been used for generic separation (see p. 389, for *rustica*) also show variation : in females of *thoracica* from *Turdus merula* 39 inner setae of the aster vary from 0·048–0·080, mean 0·059, S.D. = 0·0086 mm. and in the male 18 vary from 0·048–0·060, mean 0·056, S.D. = 0·0042 mm. (see also below p. 346 under measurements). Although in some species the lengths of these setae may be of specific value, small differences based on few specimens cannot be used for specific separation. Other examples of variation are given in the descriptions of the species.

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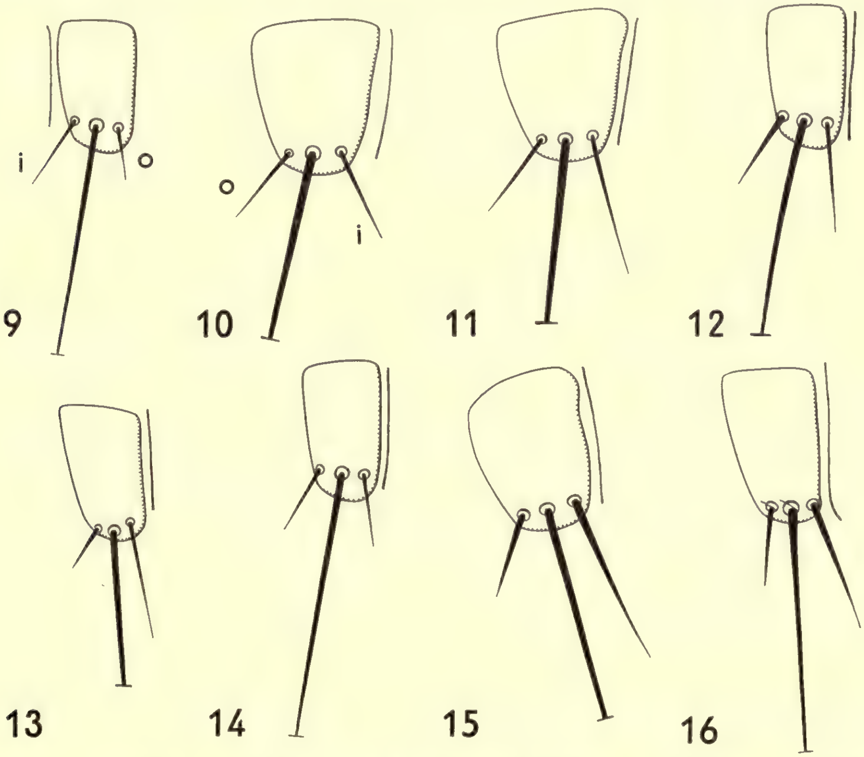
* These numbers and measurements may show some variation, so that differences must be outside the range of variation of the species being compared.

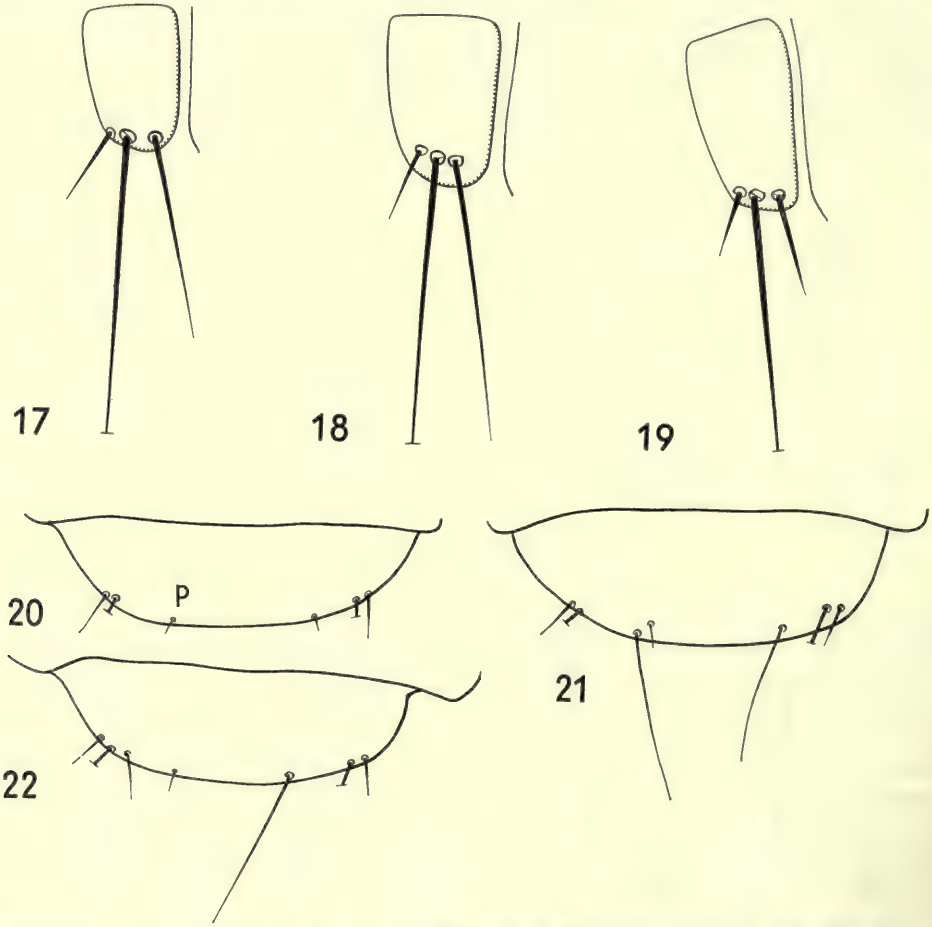
## THE SPECIES, SUBSPECIES AND LOCAL POPULATION

These categories have been discussed elsewhere, in the Philopteridae (Clay, 1958 : 132) and in the Menoponidae (Clay, 1962 : 197), but recent publications (Carriker, 1963 : 293 and Zlotorzycka, 1964 : 167–168) suggest that certain points need re-emphasis. The Mallophaga, being obligate parasites which normally do not leave the host except to pass to another of the same species during its breeding period, have



FIGS. 9–16. Setae of pleurite VIII of ♀ *Myrsidea* species. 9. *incerta*. 10. *devastator*. 11. *indigenella*. 12. *regius*. 13. *rohi*. 14. *varia*. 15. *carrikeri*. 16. *antiqua*. i, inner seta, next to sternite ; o, outer seta.

naturally formed a number of isolated populations. This has encouraged a superficial taxonomy in which populations from different hosts have been automatically named as distinct taxa on character differences which are variable or non-existent. Some of these may prove to be valid taxa but are quite unrecognizable on the published data. When a taxon is recognized on slight differences in absolute measurements, shape of head or abdomen or number of setae based on a single specimen this need not be taken seriously, but there are populations which can be shown to differ statistically by even the crudest methods. To quote Mayr (1951 : 93) : " In the past, certain authors have tried to name every population [of birds] that differs in average characters. That this policy is nonsense has been made clear by the population geneticists who have shown that no two populations of sexually reproducing animals are exactly alike in the frequencies of polymorph genes and the means of multi-



Figs. 17–22. 17–19. Setae of pleurite VIII of ♀ *Myrsidea* species. 17. *elegans*. 18. *ishizawai*. 19. *sultanpurensis*. 20–22. *Myrsidea regius*. ♀, Last tergum to show variation in chaetotaxy. p, inner posterior seta.

factorial characters." An example may be taken from the insects : Hinton (1940) showed that in some species of Elmidae (Coleoptera) mean size of certain structures differed in populations from different altitudes ; differences in mean size in populations from different hosts is of course common throughout the Mallophaga (Clay, 1962 : 198). At present it is not possible to say whether the differences are genetic or environmental as discussed by Hinton for the Elmidae (1940 : 220), but it is certain that the systematics of the group will not be clarified by giving names to all such populations. Detailed quantitative analysis as shown in Kim, Brown & Cook (1962 : 134) suggest that it may be possible to identify most individuals of such populations but this must be based on large series from a number of different hosts and all the material must be subjected to the same treatment: Kim *et al.* (1963 : 144) showed that there were differences between populations of lice from different host animals of the same species, location and sex and as a result state : " a large number of specimens from one or two host animals will not furnish a firm foundation for inference concerning ectoparasite population differences ". The results of such detailed analysis are of the greatest interest in the study of evolution and host-parasite relationships, but do not warrant the proliferation of names which would result from recognizing taxonomically such populations. It is therefore again strongly recommended when populations differ only in the mean of numbers of setae or measurements or in proportions of certain structures, especially when these follow the character gradients correlated with the size of the host (Clay, 1962 : 200), that they should be included in one taxon, the name of which is followed by *sensu lato* to indicate that it contains one or more local populations.

## *MYRSIDEA* FROM THE TURDINAE

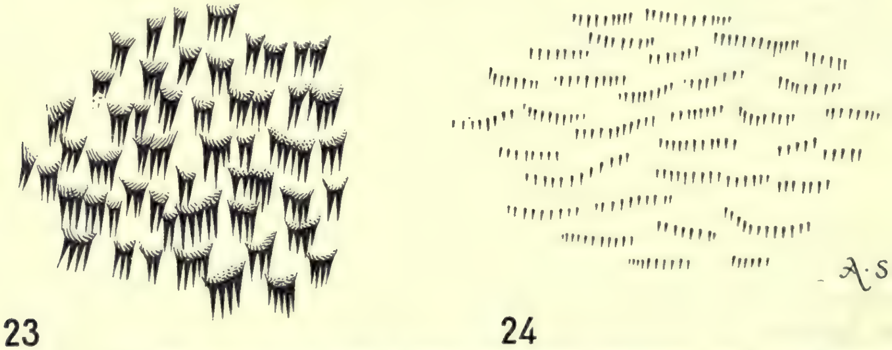
Specimens of *Myrsidea* have been seen from the following genera of Turdinae (as in Mayr & Paynter, 1964) : *Stizorhina* (one species), *Cercomela* (*C. sordida* formerly *Pinarochroa*), *Myrmecocichla* (one species), *Myiophoneus* (one species), *Zoothera* (five species) *Catharus* (six species) and *Turdus* (17 species). If the species of Mallophaga are grouped according to the form of the male genital sclerite (see above), then those from *Stizhorhina fraseri*, *Turdus*, *Catharus* and *Zoothera gurneyi* form one group ; those from *Zoothera dauma* and *Myiophoneus caeruleus* another, females only are known from *Zoothera monticola*, *marginata* and *mollisima* ; the species from *Cercomela sordida* and *Myrmecocichla formicivora* differ from each other and from the previous groups in the character of the male sclerite. The specimens from these last two hosts, from *Turdus albicollis* and the females from the three species of *Zoothera* (see above) are inadequate for description.

Species of *Myrsidea* are known from only a small proportion of the species of the Turdinae and as there is difficulty in assessing affinities in this genus and as the possibility must be accepted that there is some geographical as well as host distribution (Clay, 1964), it is probably wiser not to attempt any deductions of host relationships. One point of interest is that there are only two species of *Myrsidea* on seven species of Old World *Turdus* (see p. 385), six of these being parasitized by one species, while in the New World six species of *Catharus* have five species of *Myrsidea* and eight species of *Turdus* have 10, two of the host species (*T. fumigatus* and *T. grayi*) being parasitized by different species in different parts of their range. It is difficult to explain the presence of *M. antiqua* on *Turdus fumigatus* in Trinidad.

## TAXONOMIC CHARACTERS OF THE TURDINAE-INFESTING SPECIES

The characters listed below have been found in all the species of *Myrsidea* from the Turdinae examined and will not be repeated in the descriptions of the species and species group. These characters are not of course restricted to the species parasitic on this group of birds, but may be found throughout the genus.

1. Antenna as in Text-fig. 2; the two mushroom-like sensillae (m.) are close together near the posterior end of the anterior margin (the position of these may prove to be of taxonomic value in the Menoponidae). The antennal segments, especially the last, are liable to distortion in mounted specimens and the differences used in the key by Ansari (1956 : 164) are caused by this. Maxillary palp with the pair of setae on the dorsal surface of the last segment as in Text-fig. 1, P. The relative lengths and form of these two setae may be of taxonomic value in some genera (see *Numidicola*).



FIGS. 23–24. Comb-like projections from surface of genital chamber. 23. *Myrsidea antiqua.* 24. *M. abidae.*

2. Thorax as in Text-figs. 3, 27. Pronotum with three anterior lateral spine-like setae each side showing individual variation in length (see above under Variation, p. 334); posterior margin with 6 or 8 long stout setae. Mesonotum undivided. Posterior margin of metanotum with one long stout seta each end (not included in setal counts) and a varying number of central setae. Each metapleurite with 2–7 short to medium spine-like setae, never with one or more long stout setae. First tibia with 3 outer ventro-lateral setae (Text-fig. 5, v), a varying number of outer dorso-lateral setae (Text-fig. 5, d) and with the postero-ventral tibial seta long (Text-fig. 5, t).

3. Tergite I has a small anterior seta each side not included in the setal counts. On tergites II–VIII there is a seta (the associated post-spiracular seta) which is

usually spine-like and shorter than any other of the tergal setae and lies near the post-spiracular seta anterior to the line of the tergocentral setae. On tergite I there may or may not be (in the same species and on different sides of one specimen) a lateral seta differentiated from the rest of the marginal setae in size and position ; therefore in the counts of the tergocentral setae of I all the marginal setae except the post-spiracular are included, but in those of II–VIII the seta associated with the post-spiracular seta each side is not. The last apparent tergum (IX–XI), referred to as IX, has in both sexes one short fine seta and one long stout seta each side and 1 + 1*, occasionally 1 + 2, inner posterior setae of varying lengths (Text-fig. 20, p).

4. Sternite II always has two short lateral anterior setae (Text-fig. 26, a) each side, usually close together but occasionally separated ; these are not included in the counts of the anterior setae. Sternite II has a well marked aster of stout spine-like setae each side, the number of setae varying from 2–6. In most species the range is 3–5 as in *thoracica* females from *Turdus merula*, in which 52 asters have a mean of 3·98 spines ; in *sultanpurensis* females there are rather more, range : 4–6, mean (18) 5·5. Sternites III–VII have a line of marginal setae and none to many anterior lateral setae, which on some segments form a definite brush. The marginal setae of the brush may be distinguished from the central setae by being more spine-like and sometimes separated by a definite gap. In other cases the marginal line of setae may be continuous and the differences between the setae so slight that the division is a matter of opinion. For this reason in the Tables III–VI, " Marginal Setae " include all the setae along the posterior margin of the sternite and " Lateral Anterior Setae " include the rest of the setae in the brush. In examples of setal number and arrangements given in the text the following formula is used : a + m (a) + c + a + m (a), where (a) denotes the anterior setae in the brush, (m) the marginal setae of the brush and (c) the central sternal setae. In the female there is a single plate from the anterior margin of VII to the edge of the vulva, with the line of setae of VII clearly visible, the rest of the setae between these and the vulval setae are given as a single count under VIII–IX ; sternites III, IV or V to VI and the anterior margin of VII may be strongly arched giving a characteristic appearance to the abdomen ; there is a long stout seta each side of the anal sclerite ; ventral anal fringe with short seta centrally (Text-fig. 26). Comb-like projections of the inner surface of the genital chamber as in Text-fig. 24, with the exception of one species (*M. antiqua*, Text-fig. 23). In the male there is a single plate from sternite VIII to the end, with the line of setae of VIII clearly visible ; the setae on the plate below this are given as a single count ; posterior to the plate there is a long stout seta each side and the posterior margin of the abdomen has three or four terminal setae and 8–10 minute setae along the internal opening of the anus.

5. Pleural setae of I–VII show considerable intraspecific variation in number and length ; those of I–II at least, being short and spine-like ; pleurite VIII normally with three setae, but some specimens may have four on one or both sides. When there are three, the central one is always long and stout and the inner is usually longer than the outer (Text-fig. 9) although in some species the ranges of the two

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* X + X setae throughout the paper denotes the setae on the two sides of the body.

overlap (e.g. *regius*) ; there is some intraspecific variation in the lengths of these two setae but the differences between some species are constant both in absolute length and in the ratio between the lengths of the outer and inner setae ; in the available material of some species only one or two setae are measurable and although little can be based on this, the measurements are included in Tables VII and VIII.

### MEASUREMENTS

These are included as an assistance to identification, not as an intrinsic character of the species, as no detailed statistical analyses have been made. Such analyses are not possible in most cases owing to the paucity of material and are not necessary at this stage of the taxonomy of the genus in view of the conviction that populations which are only separable statistically should not be recognized as discrete taxa.

All measurements are given in millimetres and the number of structures measured in brackets. Total length : anterior margin of head to end of last tergum (mid-line), omitting anal fringe in female. Length of abdomen : anterior margin of tergite I to end of last tergum. The frequent distortion in mounted Menoponidae makes the measurements of metathoracic and abdominal width useless as the metapleurite and pleurites may or may not be included, therefore the metanotum and tergum V have been measured. Phase contrast has been used in the measurement of setae which enables the fine tips to be seen. The spine-like setae of the asters of sternite II may have these fine tips broken off, making a difference in measurements in the region of 0·008 mm.

Note :— In the Text-figures, setae shown by dotted lines were broken or missing in the specimen drawn and have been taken from the other side or from another specimen. Text-figs. 25–40 and 42–47 are drawn to the same scale.

### KEY TO SPECIES GROUPS

1 Hypopharynx reduced; sternite I with setae . . . . **sultanpurensis** (p. 382)
– Hypopharynx fully developed; sternite I without setae . . . . . . 2
2 Number of outer dorsolateral setae of first tibia over 14; post-spiracular seta III long; ♂ genital sclerite as in Text-fig. 72 . . . . . **ishizawai** (p. 378)
– Number of outer dorsolateral setae of first tibia under 10; post-spiracular seta III markedly shorter than II; ♂ genital sclerite otherwise . . . . . . 3
3 Long setae on posterior margin of pronotum normally 4 + 4; ♀ tergite I with median anterior emargination . . . . . . . . . . **carrikeri** (p. 369)
– Long setae on posterior margin of pronotum normally 3 + 3; ♀ tergite I without median anterior emargination . . . . . . **thoracica** (p. 340)

## THE *THORACICA* SPECIES GROUP

1. Number and position of head setae as in Text-fig. 1 ; there is individual variation in the lengths of setae 10 and 11, but the small number of setae measured show that in the majority of species 10 is a little under or over half to two-thirds the length of 11 (ratio 10/11 : 0·47–0·77). In *M. emersoni* sp. n., 10 is relatively longer (10/11 : 0·80–0·94) and in *simplex* shorter (10/11 : 0·38–0·42). These setae were not measured in *M. rohi*, *destructor*, *indigenella* and *varia*. The shape of the head is similar in *thoracica*, *emersoni*, *keniensis*, *devastator*, *indigenella*, *regius*, *varia* and *montana* (Pl. II, fig. 7 ; Text-fig. 1) ; similar in *incerta*, *pricei*, *simplex* and *destructor* (Pl. II, fig. 5) ; *abidae* as in Pl. II, fig. 4 ; *rohi* as Pl. II, fig. 6.

2. Gular setae 3–7 each side showing variation both between individuals and on the two sides of the head; total setae average 9–12.
3. Hypopharynx fully developed.

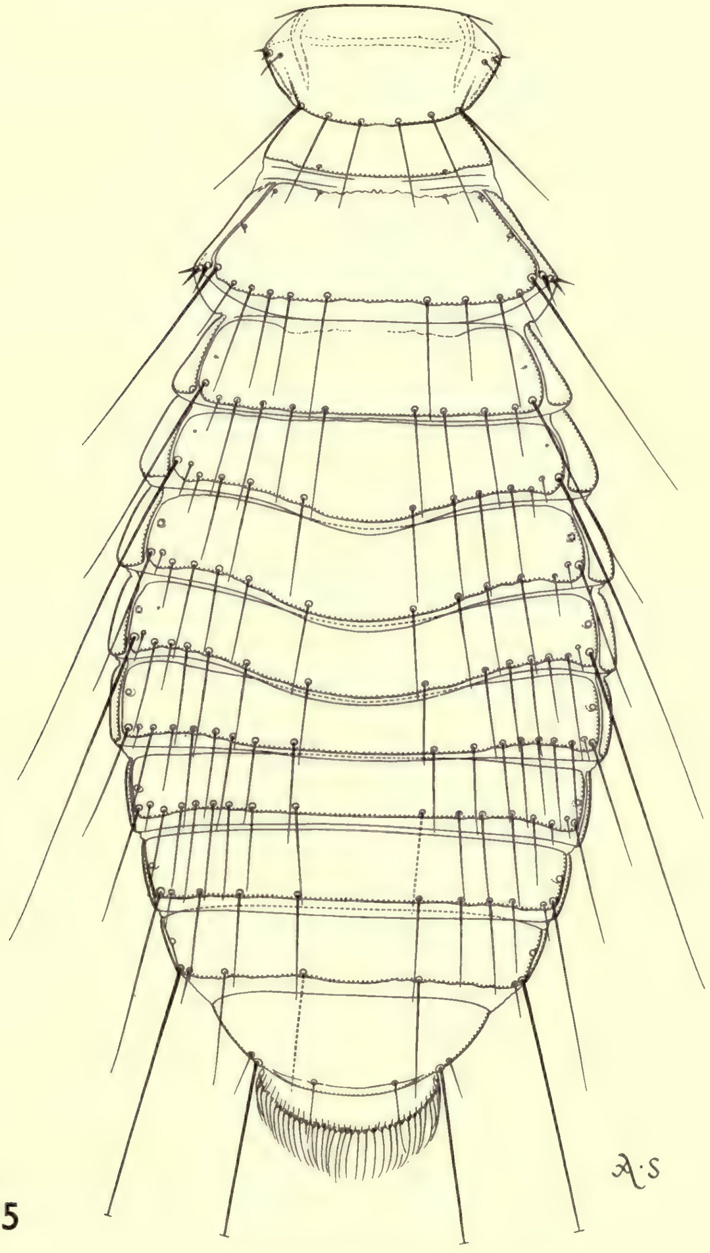

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FIG. 25. *Myrsidea thoracica*. ♀ dorsal.

4. Pronotum normally with 3 + 3 long posterior marginal setae, occasional specimens with 2 + 4 or 3 + 1.

5. Metasternal plate normally with 3–4 setae each side, occasionally 2 or 5 on one side.

6. First tibia with under 10 outer dorso-lateral setae (Text-fig. 5, d).

7. Post-spiracular setae III, V, VI considerably shorter and finer than II.

8. Sternite I without setae.

9. Male internal opening of anus with 8 minute setae.

10. Spermatheca pear-shaped or spherical with thickened rim (Pl. I, fig. 4). In *thoracica* (from *Turdus merula*) it is joined to the genital chamber by a long hyaline tube with a terminal sclerotized portion (Pl. I, fig. 5).

11. Male genitalia with form of endomeral plate and parameres constant (Pl. I, fig. 1); apparent differences in shape of parameres probably due to distortion during preparation of the specimen. Male genital sclerite characteristic with a broad flattened plate tapering to a rounded, flattened, or bulbous end. The terminal part of the sclerite is divided into two by a lateral arm each side, the posterior section varying considerably in length in different species. In mounted specimens the arms are found in all positions and it is not possible to say what is their true size and shape; the shape as shown in the figures is of no significance and cannot be used for specific determination.

## ***Myrsidea thoracica*** (Giebel, 1874)

(Pl. I, figs. 1, 5, 6; Text-figs. 1, 5–8, 25–27, 64)

Type host: *Turdus v. viscivorus* Linn.

*Menopon thoracicum* Giebel, 1874 : 287. Host: *Turdus viscivorus*.

This species, the first *Myrsidea* to be described from one of the Turdinae, resembles *incerta* and *emersoni* in the female in having tergum I unmodified, but differs in the form of tergum II (Text-fig. 25). The male is distinguished by the details of the abdominal chaetotaxy and genital sclerite (Text-fig. 64).

♀ and ♂ (from *Turdus viscivorus*). Setae of latero-ventral fringe: 11–12. Range of central marginal setae of metanotum: ♀, 8–10, mean (5) 8·8; ♂, 6–9, mean (7) 7·4. Outer dorsal setae of first tibia: ♀, 5–7, mean (10) 6·1; ♂, 5–7, mean (14) 6·0. Setae of femoral brush: ♀, 17–24, mean (10) 20·6; ♂, 13–22, mean (14) 17·2. Female abdominal sternites not markedly arched (Text-fig. 26).

Abdominal Chaetotaxy. In the female, post-spiracular seta VII is shorter and finer than VIII. There is some individual variation in the lengths of the post-spiracular setae III and V–VII; Text-fig. 25 was drawn from a female in which these setae are unusually short. Range of the lengths (in mm.) of six of these setae in ♀: III, 0·20–0·27; V, 0·16–0·20; VI, 0·16–0·23; VII, 0·24–0·31. Tergocentral setae: ♀, Text-fig. 25 and Table I; the outer tergocentral setae on VIII are usually approximately the same length as the inner, in one female out of four this seta on one side is appreciably shorter, being about two-thirds the length of the inner. ♂ setae Table II. Sternal setae: ♀ (Text-fig. 26), II, 7–11 anterior, mean (5) 8·6; 15–18 marginal, mean 16·8; III–IX, Tables III–IV. ♂ (Text-fig. 27), II, 5–8 anterior, mean (7) 6·3; 10–14 marginal, mean (7) 12·1; III–IX, Tables V–VI. In both sexes 3–4 setae in aster; sternite III sometimes with 1–2 anterior median setae.

In addition to these specimens from the type host (*Turdus viscivorus*), others conspecific with *M. thoracica* have been seen from the following hosts: *Turdus boulboul*, *T. merula*, *T. chrysolaus*, *T. obscurus* and *T. ruficollis*. All these agree with typical *thoracica* in the characters of the female tergites and male genital sclerite. Females from *Turdus merula* have the longer post-spiracular setae on VII (0·34–0·40) as in the specimens from *T. boulboul* (see below) and the relative lengths of the tergocentral setae of VIII vary as in specimens from the type host, but the outer seta is usually shorter than the inner and may be only a third of the length of the latter. They average rather smaller than those from the type host, range of head breadth : 0·52–0·54, mean (14) 0·53 ; in the males there appear to be no significant differences.

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* Numbers in brackets denote number of specimens.

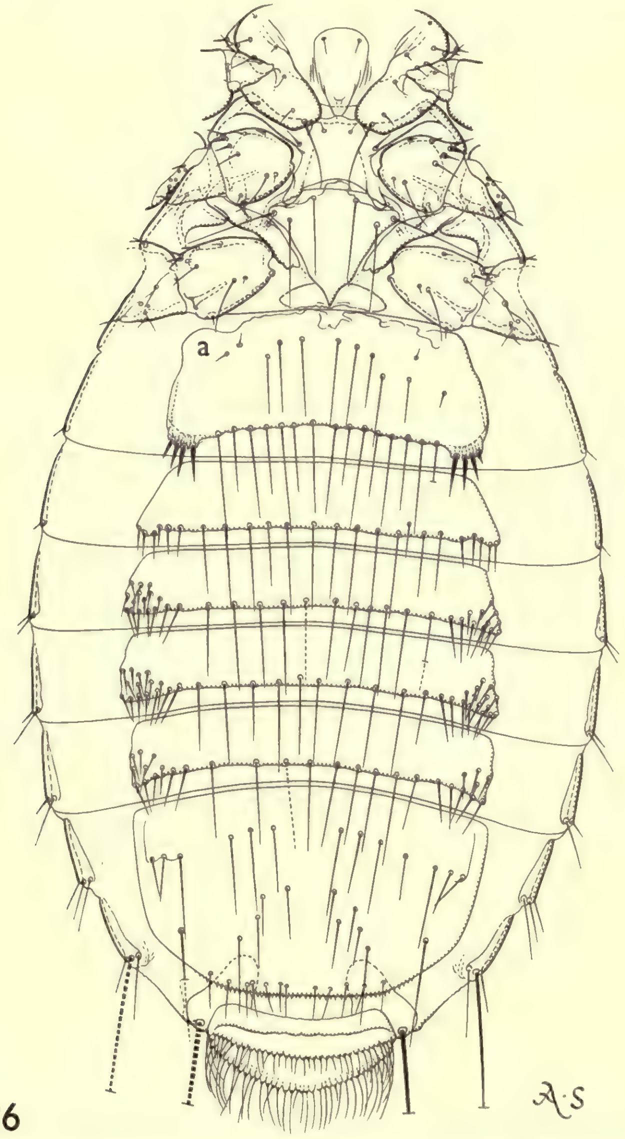

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FIG. 26. *Myrsidea thoracica.* ♀, ventral. a, anterior lateral setae of sternite II.

The host is rather smaller, wing length : 126 mm. compared to 151 mm. in *T. viscivorus*. Six males and seven females from *Turdus obscurus* average somewhat smaller than those from the type host, range of head breadth : ♀, 0·49–0·51, mean (7) 0·50 and ♂, 0·45–0·46, mean (6) 0·455 ; the size of the host is smaller, wing length : 122 mm. There is only one measurable post-spiracular seta VII among the females and this falls within the range of typical *thoracica*. Five females from *T. chrysolaus* are similar to those from *T. obscurus* in breadth of head : 0·49–0·51, mean (3) 0·50 ; host wing length : 125 mm. ; length of post-spiracular seta VII is within the typical range. Two females (head breadth : 0·54) from *T. ruficollis* do not appear separable from specimens from the type host. There is no advantage in separating these populations taxonomically and all should be included in *M. thoracica*.

One male and eight females from *T. boulboul* present a rather different problem as they show a number of small character differences from the available specimens from *T. viscivorus*. These include a larger number of abdominal setae on some segments : tergites I–VII (♀), for instance, although the breadth of these is similar in the specimens from *T. viscivorus* and *boulboul*, those from the type host have a total of 73–82 tergocentral setae, mean (4) 76·5 and those from *boulboul* 82–95, mean (4) 89·2 ; the tergocentral setae of VI in the former total 11–13, mean (5) 12 and the latter 13–16, mean (8) 14·7. The setae in the brush on the third femur (♀) number in specimens from the type host 17–24, mean (10 femora) 20·6 and in those from *T. boulboul* : 24–32, mean (16) 28·4, the number of setae of only one femur in these eight specimens overlap with the typical population ; the length of the third femur although showing some overlap averages smaller in specimens from the type host : 0·25–0·27 mm., mean (10) 0·26 and those from *T. boulboul* : 0·27–0·30 mm., mean 0·28. In only one female from *T. boulboul* are the post-spiracular setae measurable and of these only III (0·27 mm.) is within the range of the typical population ; V is 0·256, VI, 0·260 and VII 0·380. The lengths of the longest spine in the female aster overlap but those from the type host average less: 0·056–0·076, mean (9 spines) 0·069 and in those from *T. boulboul* : 0·070–0·094, mean (9) 0·085. On the available material, size as shown by length and breadth of head, breadth of prothorax, metanotum and tergite IV and total length and length of abdomen (these last two are unreliable measurements) appear to be similar in specimens from the two hosts. The size of the two hosts based on wing length measurements are similar, although the wings of *T. boulboul* appear to average slightly less. However, even in the small numbers available from *T. boulboul* the characters show some overlap with those of specimens from the type and other hosts and as our present knowledge of *thoracica* sens. lat. is based on a small number of populations represented by few individuals, the single male and eight females from *T. boulboul* are included in *thoracica* sens. lat. with the other specimens discussed above.

Material examined. From *Turdus v. viscivorus* Linn., 7 ♂, 5 ♀, 5 nymphs. BRITISH ISLES: Somerset, 1 ♂, 1 ♀, v.1934 (*R. Meinertzhagen*, no. 916) ; Yorkshire, 1 ♂, 1 ♀, 5.iii.1956 ; Scotland, Arran, 2 ♂, 2 ♀, 24.viii.1925 (*J. Waterston*) ; Co. Mayo, 3 ♂, 1 ♀, 5 nymphs, i.1947 (*R. Meinertzhagen*, no. 16407).

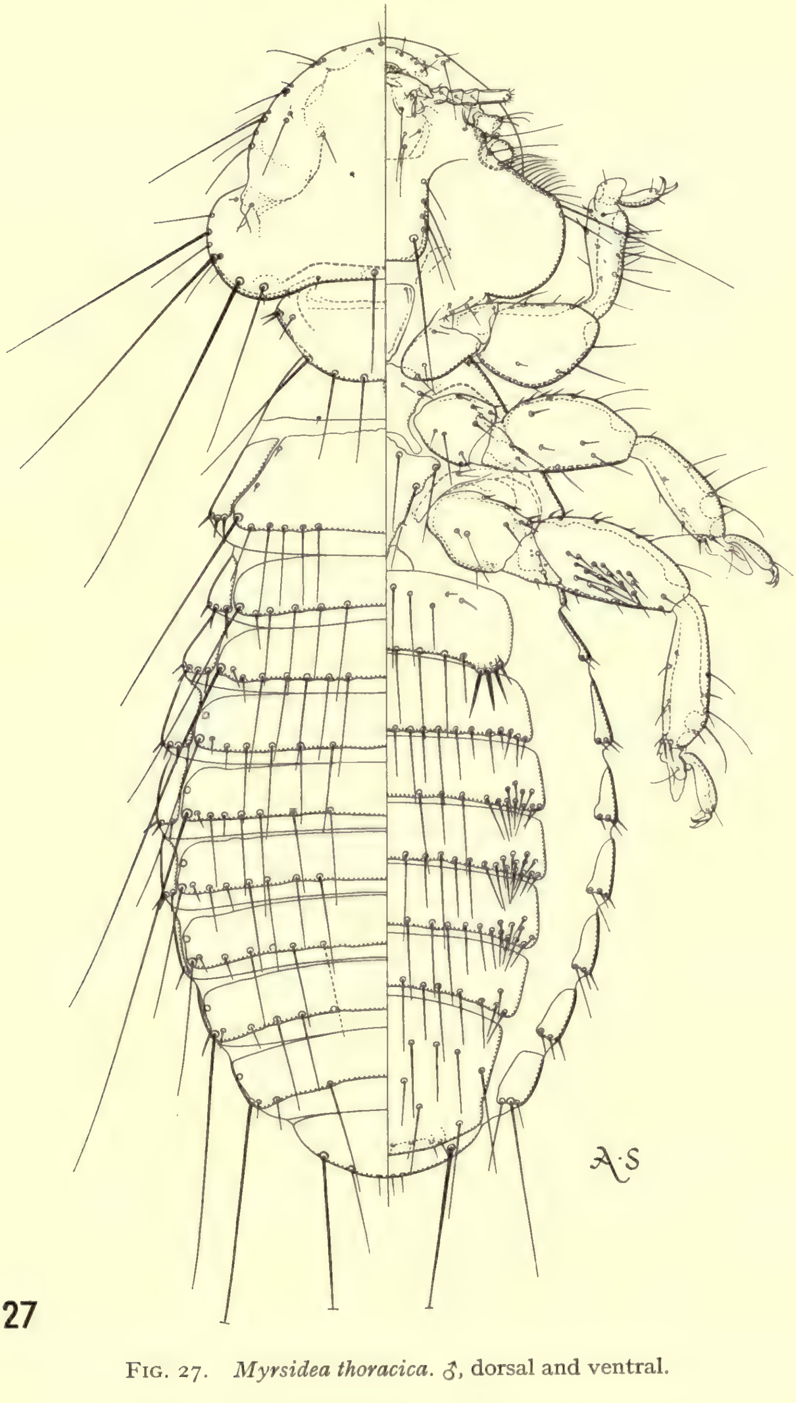

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FIG. 27. *Myrsidea thoracica*. ♂, dorsal and ventral.

From *Turdus m. merula* Linn., 24 ♂, 33 ♀, British Isles : various localities, B.M. (N.H.).

From *Turdus c. chrysolaus* Temminck, Formosa : Chao Chou, 5 ♀, 6.iv.1960 (*R. E. Kuntz*), E.C.

From *Turdus obscurus* Gmelin, 6 ♂, 7 ♀. Malaya : Mt. Brinchang, 5 ♂, 3 ♀, 16.iii.1963. Formosa : Lin-tou, 1 ♂, 5 ♀, 22.iv.1961 (*R. E. Kuntz*), E.C.

From *Turdus ruficollis atrogularis* Jarocki, India : Rajputana, 2 ♀, i.1936 (*R. Meinhertzhagen*, no. 4763), B.M. (N.H.).

From *Turdus boulboul* (Latham), Nepal, 1 ♂, 8 ♀, x.1935 (*R. Meinertzhagen*, no. 4540), B.M. (N.H.).

*Measurements*

Specimens from Type Host

| | | ♀ | | | | ♂ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Length | Breadth | | | Length | Breadth | | |
| | | | | Range | Mean (5) | | | Range | Mean (8) |
| Head | 1 | 0·36 | 0·39 | .. | .. | 0·33 | 0·36 | .. | .. |
| | 2 | | 0·56 | 0·53–0·56 | 0·55 | | 0·49 | 0·47–0·50 | 0·49 |
| Prothorax | | | 0·34 | .. | .. | .. | 0·29 | .. | .. |
| Metanotum | | | 0·48 | .. | .. | .. | 0·38 | .. | .. |
| Abdomen | | 1·11 | 0·64 | .. | .. | 0·79 | 0·53 | .. | .. |
| Total | | 1·96 | .. | .. | .. | 1·54 | .. | .. | .. |

Lengths of spines in aster ♂ : 1st (outer) 0·024–0·032 (11) ; 2nd 0·040–0·054 (11) ; 3rd 0·044–0·060 (10) ; 4th (inner) 0·058–0·080 (10), mean 0·065.

Specimens from *Turdus merula*

| | ♀ | | ♂ | |
|---|---|---|---|---|
| | Range | Mean | Range | Mean |
| Number of spines in aster . | 3–5 (52) | 4 | 3–4 (16) | 3·8 |
| Length of inner spine . . | 0·048–0·080 (39) | 0·059 | 0·048–0·060 (18) | 0·056 |

## ***Myrsidea emersoni* sp. n.**

(Text-figs. 28, 65)

Type host : *Turdus migratorius* Linn.

This species is similar to *thoracica* from which it is distinguished in the female by the form of the abdominal terga and in the male by the genital sclerite which is swollen distally.

♀ and ♂. As in the description and figures of *thoracica* with the differences shown in Text-figs. 28 and 65 and as follows : head seta 10 is longer : ♀, 0·090–0·094 mm. compared with 0·064–0·072 in *thoracica*, ratio of 10/11 : 0·82–0·94 in *emersoni* compared with 0·57–0·67 in *thoracica*. The ranges of the number of setae in the brush of the third femur overlap but the new species has a higher average (♀, range 21–28, mean (8) : 25·1 ; ♂, range 18–25, mean (9) : 21·7). The ranges of the numbers of the tergal and sternal setae overlap but more material may show differences in the means ; the post-spiracular setae as in *thoracica*, but in the female VII is long as in the population from *Turdus merula*. As in *thoracica* there may be a few anterior median sternal setae : 5 ♀, III, 1–3 ; 5 ♂, III, 1–3 ; VI, 1 ; VIII, 1. In the female the two posterior setae on tergum IX are short and fine (as in Text-fig. 28) and in the male the central tergocentral setae of VIII are longer than in *thoracica* ; in the latter these setae reach to or just beyond the end of the abdomen and in *M. emersoni* the part beyond the end of the abdomen is at least as long as the part from the setal base to the end of the abdomen. Measurements of the two species are similar except that the head breadth of the five males of *emersoni* averages somewhat larger (range, 0·50–0·52 mm., mean : 0·51).

Material examined. 5 ♂, 5 ♀ from *Turdus migratorius*, U.S.A. as follows : ALASKA : Juneau, 3 ♂, 2 ♀, 6.viii.1950, (*R. B. Williams*, 50–10847). MARYLAND, Beltsville,

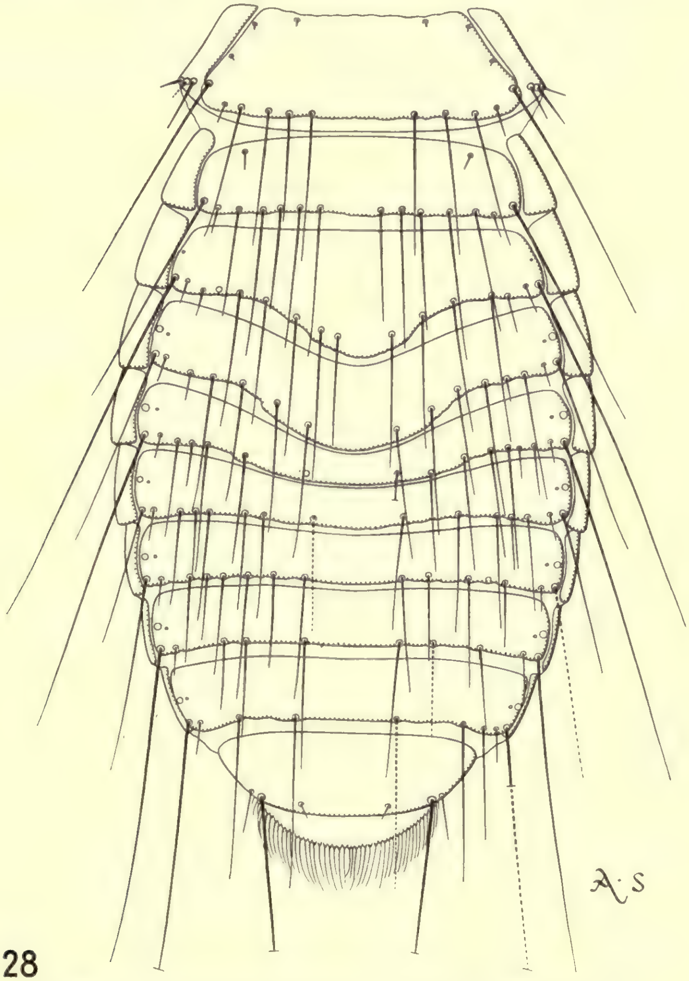

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FIG. 28. *Myrsidea emersoni*. ♀ dorsal. Holotype.

1 ♂, 3 ♀, 28.vii.1947 (*F. R. Smith*, 53–7683); Silver Spring, 1 ♂, 18.v.1942 (*F. C. Bishop*, 31649, 42–5786).

Holotype ♀ and allotype ♂ in U.S. National Museum (slide 46, B) from *Turdus migratorius*, MARYLAND, Beltsville, 28.vii.1947 (*F. R. Smith*, 53–7683).

Paratypes 4 ♂, 4 ♀ with the data as given under material examined.

This species is named in honour of Dr. K. C. Emerson to whom I am indebted for the loan of much material.

### ***Myrsidea keniensis*** **sp. n.**

(Text-fig. 29)

Type host: *Turdus abyssinicus abyssinicus* Gmelin.

This species is distinguished in the female by the form of the anterior tergites (Text-fig. 29). No constant characters have been found for separating the three available males from those of *thoracica*.

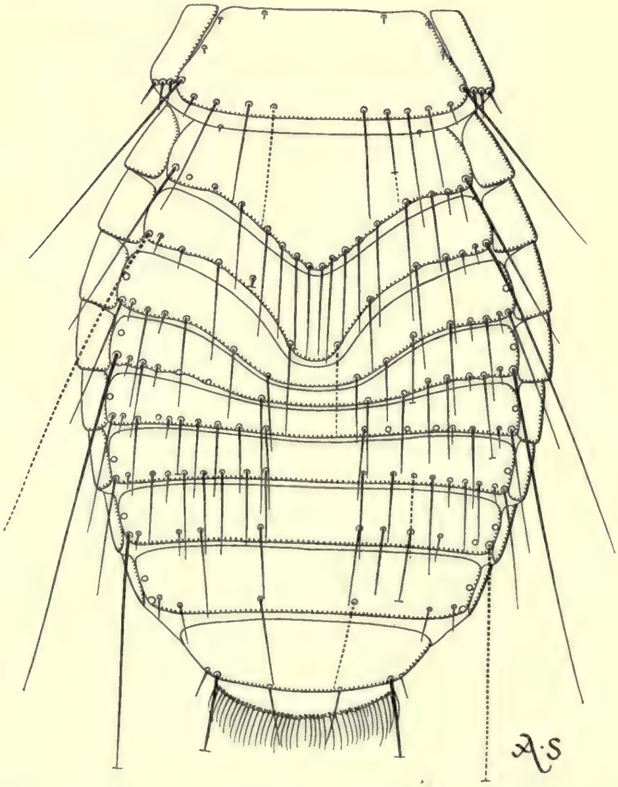

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FIG. 29. *Myrsidea keniensis*. ♀, dorsal. Holotype.

♀ and ♂. Setae of latero-ventral head fringe : 10–11, mean of 10 sides : 10·2. Central setae of metanotum : 2 ♀, 4 + 5, 6 + ?4 ; 3 ♂, 2–4 each side. Outer dorsal setae of first tibia : 5 + 5. Setae of femoral brush : 2 ♀, 21 + 17, 22 + 23 ; ♂, range in six legs : 15–21, mean 17·3. Female sternites V–VI slightly arched. Male genital sclerite appears indistinguishable from that of *thoracica*.

Abdominal Chaetotaxy. Tergocentral setae : see Tables I–II. In the female, sternite II has 5 anterior setae, 12–13 marginal setae and 4 + 4 in the aster. In the male, II has 5–7 anterior setae, 11 marginal setae and 4 + 4 spines ; range of longest spine (4) in each aster : 0·082–0·096 mm. Sternal setae of III–IX as follows : ♀, III, 5 (2) + 12 + 5 (1) ; IV. 12 (6) + 9 + 10 (3) ; V, 16 (8) + 9 + 12 (5) ; VI, 10 (5) + 8 + 10 (4) ; VII, 3 + 2 + 3 + 3 ; VIII–IX, 5 + 5 ; vulval setae, 14–15 : ♂, III, 4 (1) + 12 + 5 (1) ; IV, 12 (6) + 9 + 14 (7) ; V, 14 (8) + 9 + 14 (8) ; VI, 12 (6) + 8 + 11 (5) ; VII, 4 + 8 + (1) ; VIII, 3 + 3 ; IX, 7 + 5.

Material examined. 3 ♂, 2 ♀ from *Turdus a. abyssinicus* (= *Turdus olivaceus abyssinicus*), KENYA, i.1936 (*R. Meinhertzhagen*, no. 6149), B.M. (N.H.).

Holotype ♀ (slide no. 6149a), allotype ♂ (slide no. 6149b).

Paratypes : 1 ♀, 2 ♂ from the type host with the above data.

*Measurements*

| | ♀ | | ♂ | |
|---|---|---|---|---|
| | Length | Breadth | Length | Breadth |
| Head 1 | 0·34–0·35 | 0·37–0·38 | 0·33–0·34 | 0·34 |
| Head 2 | | 0·53–0·55 | | 0·47–0·48 |
| Prothorax | .. | 0·31–0·32 | .. | 0·29–0·30 |
| Metanotum | .. | 0·43–0·44 | .. | 0·35–0·37 |
| Abdomen | 0·79–0·87 | 0·59–0·61 | 0·72–0·74 | 0·49 |
| Total | 1·51–1·63 | .. | 1·38–1·42 | .. |

## ***Myrsidea incerta*** (Kellogg, 1896)

(Pl. II, fig. 5 ; Text-figs. 9, 30, 48, 66)

Type host : *Catharus ustulatus* (Nuttall).

*Menopon incertum* Kellogg, 1896 : 533, pl. 73, f. 2. Host : *Spinus tristis* and *Turdus ustulatus* from Palo Alto, California.

*Myrsidea scabiei* Ansari, 1956 : 167, fig. 4. Host : *Hylocichla ustulata*. **syn. n.**

The description of this species was based on specimens taken from the two hosts given above. In the collection of the Division of Entomology, University of California, there are two slides labelled types of *Menopon incertum* from *Spinus tristis* and *Turdus ustulatus* respectively. The slide labelled *Turdus ustulatus* is marked "fig'd", meaning that one of the specimens was figured in the original description ; further there are no males among the specimens from *Spinus*, but two males in those from *Turdus*. For these reasons a female on the *Turdus* slide is selected as lectotype thus fixing the type host of *Myrsidea incerta* as *Catharus ustulatus*.

The specimens are in poor condition, having lost many of the setae and two are headless, the figure of the female (Text-fig. 30) has, therefore, been made from a specimen from the type host from British Colombia. The description (including variation) is based on the type series of *incerta* and *scabiei* and on other specimens from the type host. This species is distinguished in the female from all others considered here by the slight modification of the abdominal terga, the posterior margins of I and II being only slightly convex (Text-fig. 30). The male is distinguished by the genital sclerite (Text-fig. 66) and the tergal chaetotaxy (Text-fig. 48).

♀ and ♂. Setae of latero-ventral head fringe: 9–11, mean (17) 10·2. Central setae of metanotum: ♀, 3 + 3, 4 + 4, or 4 + 5; ♂, 3 + 3 or 3 + 4. Outer dorsal setae of first tibia: 27 ♀, 10 ♂, 4. Setae of femoral brush: ♀, 13 – 17, mean (26 legs) 15·2; ♂, 12–16, mean (8) 13·4. Abdomen with sclerites well pigmented; female abdominal sternites III–VI slightly arched.

Abdominal Chaetotaxy. Post-spiracular setae VII varies somewhat in length and may be the same as III or somewhat longer, but is always markedly shorter and finer than VIII. Range of tergocentral setae: ♀, see Table I; ♂, owing to the poor condition of specimens it is not possible to give an accurate count of the variation, but it appears to be as follows: I, 2–4, each side of abdomen; II, 2–5; III–IV, 3–5; V–VI, 2–4; mean of total for each tergite: I (4) 6·5; II (4) 7·5; III (4) 7·8; IV (3) 8·5; V (5) 6·8; VI (4) 5·75. VII–VIII in all available males have

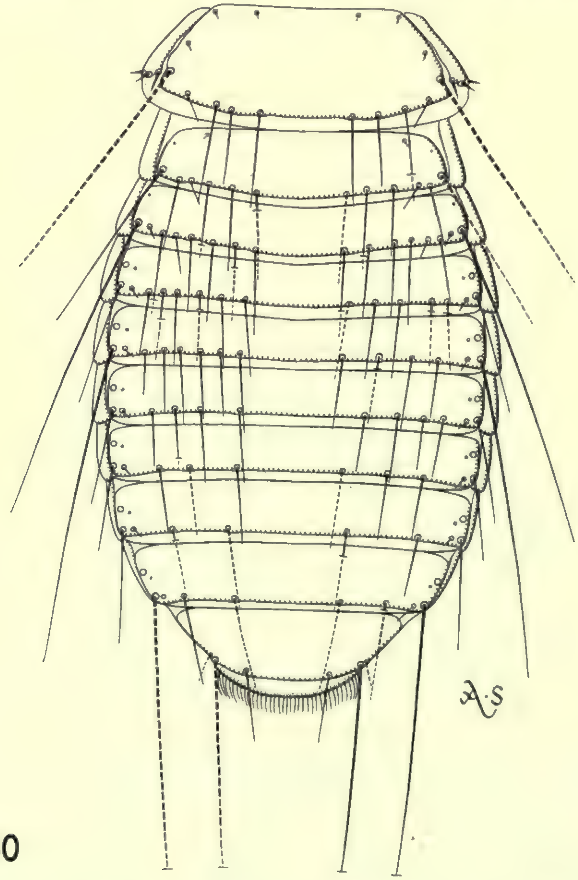

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FIG. 30. *Myrsidea incerta*. ♀, dorsal.

2 + 2 with lengths as shown in Text-fig. 48. In most specimens the first tergocentral setae each side is short and rather spine-like. Sternal setae : ♀, II, 4–6 anterior ; 11–14 marginal ; setae in aster normally 4 + 4 but range in 19 specimens : 3–5. III–IX see Tables III–IV. ♂, II, 4–5 anterior ; 10–12 marginal ; aster : 3 + 4 (4), 3 + 3 (2). III, 0–3 lateral anterior setae each side ; 8–10 marginal setae. IV, 2–4 lateral anterior , 11–14 marginal. V, 3–6 ; 12–14. VI, 2–4 ; 10–14. VII, 0–1 ; 6–11. VIII, 4–6. IX, 4–6.

Material examined. 6 ♂, 17 ♀ from *Catharus ustulatus*, U.S.A. : California, Palo Alto, 3 ♂, 7 ♀ syntypes of *incerta* (*V. L. Kellogg*), Division of Entomology, University of California (2 ♂, 6 ♀) and U.S. National Museum (1 ♂, 1 ♀). U.S.A. : various localities, 1 ♂, 5 ♀, U.S. National Museum and E.C. CANADA : British Columbia, Mandarte Is., 1 ♀ (*G. J. Spencer*). MEXICO : Tres Zapotes, 2 ♂, 4 ♀, types of *M. scabiei* (*M. A. Carriker*, no. 15), C.C. These last specimens are on two slides, one with 1 ♂, 2 ♀ has pencil tick denoting male holotype and female allotype. As the latter cannot be identified the two females on this slide must be considered as paratypes.

From *Turdus minimus bicknelli* (Ridgway), U.S.A. : Elmhurst, New York, 1 ♀, 21.v.1934 (*M. V. Beals*).

LECTOTYPE of *M. incerta* (Kellogg) by present designation : ♀ on slide marked " fig 'd" in the University of California with data as given above.

*Measurements*

| | ♀ Lectotype | | ♂ Paralectotype | |
|---|---|---|---|---|
| | Length | Breadth | Length | Breadth |
| Head 1 | 0·30 | 0·34 | 0·30 | 0·32 |
| Head 2 | | 0·45 | | 0·42 |
| Prothorax | . . | 0·28 | . . | 0·28 |
| Metanotum | . . | 0·37 | . . | 0·32 |
| Abdomen | 0·77 | 0·50 | 0·66 | 0·44 |
| Total | 1·42 | . . | 1·27 | . . |

| | | |
|---|---|---|
| Range head length | 0·29–0·32, mean (10) : 0·30 | 0·27–0·30, mean : 0·29 |
| Range head breadth 1: | 0·32–0·35, mean (11) : 0·33 | 0·29–0·32, mean : 0·31 |
| Range head breadth 2: | 0·43–0·46, mean (11) : 0·45 | 0·39–0·42, mean : 0·41 |

## *Myrsidea pricei* sp. n.

(Text-figs. 31, 49)

Type host : *Catharus guttatus* (Pallas).

This species resembles *M. incerta*, from which it is distinguished in the female by the shape of the first two abdominal terga (Text-fig. 31) and in the male by the lengths of the outer tergocentral setae of VII–VIII (Text-fig. 49). Both male and female average somewhat larger and the number of setae in certain groups average more.

♀ and ♂. As described for *incerta* with the following differences : In the small number of specimens available, both sexes average larger ; range of head length of female : 0·320–0·340, mean (6) 0·325 ; head breadth 1 : 0·350·0·370, mean 0·360 ; head breadth 2 : 0·460–0·490, mean 0·470. In the male head length : 0·290–0·310, mean (4) 0·300 ; head breadth 1 : 0·320–0·330, mean 0·325 ; head breadth 2 : 0·410–0·440, mean 0·422. Central setae of metanotum ♀, 8–10 mean (6) 9·3 ; ♂, 4–9, mean (4) 7. Number of setae in third femoral brush : ♀, 15–20, mean (18) 16·2 ; ♂, 14–17, mean (8) 15·25. Male genital sclerite similar to that of *incerta*, possibly more swollen posteriorly, but it is difficult to be certain on the available material.

*Abdominal Chaetotaxy*. Tergocentral setae : see Tables I and II. The outer tergocentral setae each side of VII and VIII in the male are about half the length of those in *incerta* and the setae of pleurite VIII are longer (see Tables VII and VIII). Sternal setae as in *incerta*.

Material examined. 6 ♂, 14 ♀, 2 nymphs in the U.S. National Museum from *Catharus guttatus*, U.S.A. as follows : NEW YORK : Elmhurst, 1 ♂, 3 ♀, 18.x.1930 ; 1 ♀, 31.x.1930 ; 2 ♀, 27.xi.1930 ; 1 ♂, 1 ♀, 19.x.1936 ; 1 ♂, 1 ♀, 17.x.1937 ; 1 ♂, 21.x.1937 (*M. V. Beals*). MINNESOTA : Cass Lake, 1 nymph, 13.v.1930 (*O. L. Austin*). N. CAROLINA : Graingers, 2 ♂, 3 ♀, 1 nymph, 1.iv.1933 (*Peters & Lunz*). GEORGIA : Valdosta, 3 ♀, 22.xi.1935 (*B. V. Travis*).

Holotype ♀ and allotype ♂ in U.S. National Museum, Washington (slide no. 26819, 37–2682) from *Catharus guttatus* from U.S.A. : New York, Elmhurst, 19.x.1936 (*M. V. Beals*).

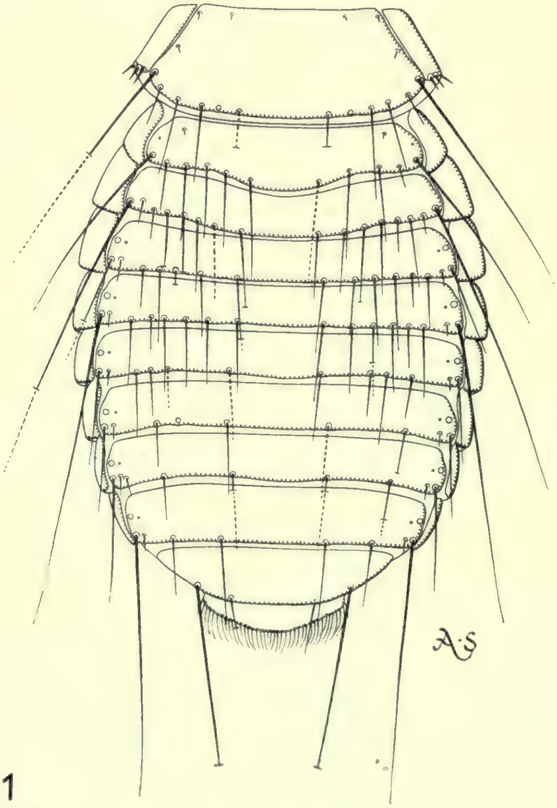

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FIG. 31. *Myrsidea pricei*. ♀, dorsal. Holotype.

Paratypes : 5 ♂, 13 ♀ with data as given above under material examined.

This species is named in honour of Professor Roger D. Price, who together with his collaborators, is producing important revisions of Mallophagan genera.

### ***Myrsidea destructor*** Ansari, 1956

(Text-figs. 32, 50, 67)

Type host : *Catharus m. mexicanus* (Bonaparte).

*Myrsidea destructor* Ansari, 1956 : 166, fig. 2. Host : *Catherus m. mexicanus* [sic].

This is one of the smaller forms and is distinguished in the female by the characters of the anterior abdominal tergites (Text-fig. 32). The differences between the male and that of *devastator*, which in the characters of the tergal chaetotaxy and genitalia it resembles most nearly, are given under that species.

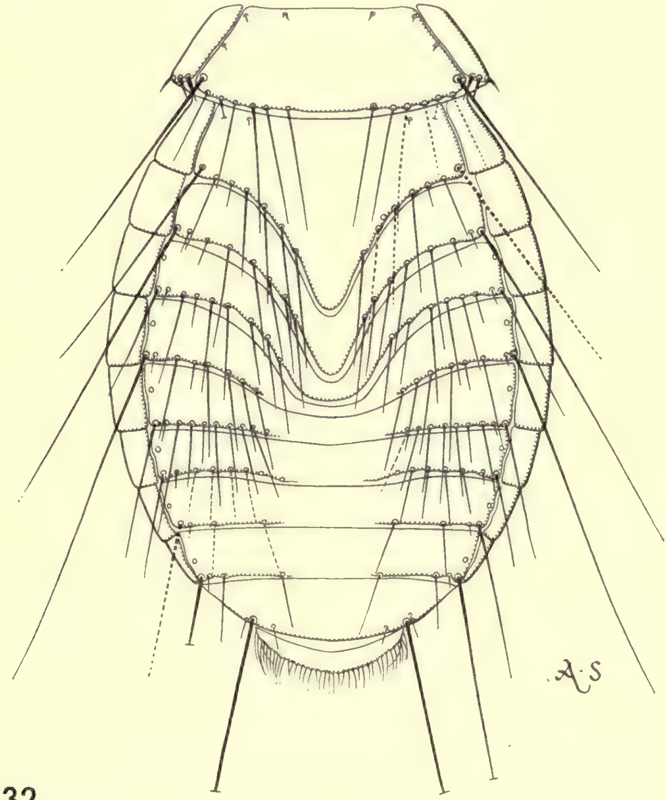

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FIG. 32. *Myrsidea destructor.* ♀, dorsal. Allotype.

♀ and ♂. Setae of latero-ventral head fringe : 9–10. Central marginal setae of metanotum 6 + 6 (♀), 4 + 4 and 4 + 5 (♂). Outer dorsal setae of first tibia in all specimens 4. Setae of third femoral brush : 14 + 14 (♀), 13 + 13 (2 ♂). Female abdominal sternites V–VI strongly arched. Male genital sclerite in both males is distorted but appears to be slightly swollen distally (Text-fig. 67).

Abdominal Chaetotaxy. Post-spiracular setae VII in female shorter and finer than VIII but longer than VI, in male VII is longer and stouter than in female, but not as long and stout as VIII. Tergocentral setae of single female as in Text-fig. 32 ; in two males : I, 12; 11. II, 11 ; 10. III, 10 ; 9. IV, 10 ; 12. V, 9 ; 10. VI, 10 ; 10. VII, 4 ; 4. VIII, 4 ; 4 ; Text-fig. 50 for lengths of posterior setae. Sternal setae in single female : II, 3 + 3 anterior, 16 marginal and 4 + 4 in aster ; III, 5 (1) + 12 + 5 (1) = 20 marginal ; IV, 8 (2) + 9 + 9 (4) = 20 marginal ; V, ?9 (?3) + 9 + 9 (3) = ?21 ; VI, 8 (3) + 8 + 8 (4) = 17 ; VII, 2 (0) + ?2 + 2 + ?3 (1) = ?8 marginal ; the specimen is not in sufficiently good condition to see the posterior setae. Sternal setae of male paratype : II, 5 anterior, 13 marginal and 4 + 4 in aster ; III, 5 (0) + 11 + 6 (2) = 20 marginal ; IV, 10 (4) + 10 + 8 (4) = 20 ; V, 10 (4) + 8 + 9 (4) = 19 ; VI, 8 (3) + 9 + 8 (3) = 19 ; VII, 3 (0) + ?2 + 4 + 3 (1) = ?8 ; VIII, 6 ; IX to end, 8.

Material examined. Holotype male and allotype female from *Catharus m. mexicanus*. MEXICO : Vol. San Martin, 16.iv.1940 (*M. A. Carriker* no. 754), M.C. 1 ♂ paratype on slide with same data (and " paratype " written in ink).

*Measurements*

| | ♀ | | ♂ | |
|---|---|---|---|---|
| | Length | Breadth | Length | Breadth |
| Head 1 | 0·30 | 0·33 | 0·27 | 0·30 |
| Head 2 | | 0·42 | | 0·39 |
| Prothorax | .. | 0·25 | .. | 0·24 |
| Metanotum | .. | 0·33 | .. | 0·31 |
| Abdomen | 0·72 | 0·50 | 0·50 | 0·42 |
| Total | 1·35 | .. | 1·08 | .. |

## ***Myrsidea devastator*** Ansari, 1956

(Text-figs. 10, 33, 52, 68)

Type host : *Turdus s. serranus* Tschudi.

*Myrsidea devastator* Ansari, 1956 : 167, fig. 3. Host : *Turdus s. serranus.*

This species is distinguished in the female by the form of the anterior terga and the large number of setae on terga I–II (Text-fig. 33). The male resembles *M. destructor* in the sparse setae of terga VII–VIII, but is larger.

♀ and ♂. Setae of latero-ventral head fringe : 10–11. The long lateral seta of the metanotum is missing on both sides in one female and on one side in one male ; central setae : ♀, 18–21 ; ♂, 10–13. Outer dorsal setae of first tibia 4. Setae of femoral brush : ♀, 22–26, mean (14) 24·3 ; ♂, 19 (3). In the holotype male the second and third legs are deformed and have abnormal chaetotaxy. Female abdominal sternites V–VI strongly arched. Male genital sclerite swollen distally (Text-fig. 68).

Abdominal Chaetotaxy. In the female, post-spiracular seta VII is shorter and finer than VIII, in the male it is similar to VIII. Tergite I–II in female with numerous long setae each side, some of which are anterior to the marginal row ; on I some of the more lateral ones are stout and somewhat spine-like. Tergocentral setae : ♀, Table I ; on VII–VIII the outer seta of the two is longer than the inner and in some specimens the two central setae on the posterior margin of IX are shorter than shown in Text-fig. 33 and vary in length on the two sides. 2 ♂, I, 14–18 ; II, 15–16 ; III, 12–14 ; IV, 13 ; V, 11–13 ; VI, 9 ; posterior segments Text-fig. 52. Sternal setae : ♀, II, 12–15 anterior, 21–22 marginal, setae in aster usually 4 + 4, range 2–4 ; ♂, 5–8 anterior, 15–17 marginal, 3–4 in aster. In both sexes the innermost seta in aster is long (see measurements). Female : III, 6 (0) + 7 + 8 (1) ; IV, 18 (10) + 5 + 19 (12) ; V, 17 (10) + 9 + 17 (9) ; VI, 13 (7) + 8 + 13 (7) ; VII, 4 (1) + 3 + 3 + 4 (1) ; VIII–IX, 9 + 8 ; vulva, 15. ♂, III, 5 (0) + 9 + 5 (0) ; IV, 14 (7) + 6 + 12 (6) ; V, 14 (7) + 7 + 16 (9) ; VI, 12 (5) + 6 + 13 (6) ; VII, 7 (2) + 5 + 5 (2) ; VIII, 2 + 3 ; IX, 5 + 4. On sternites II–V there is a definite gap between the central and lateral marginal setae, also sometimes on VI–VII. Pleural setae VIII usually 3 + 3 but two of the ten females have 4 + 3.

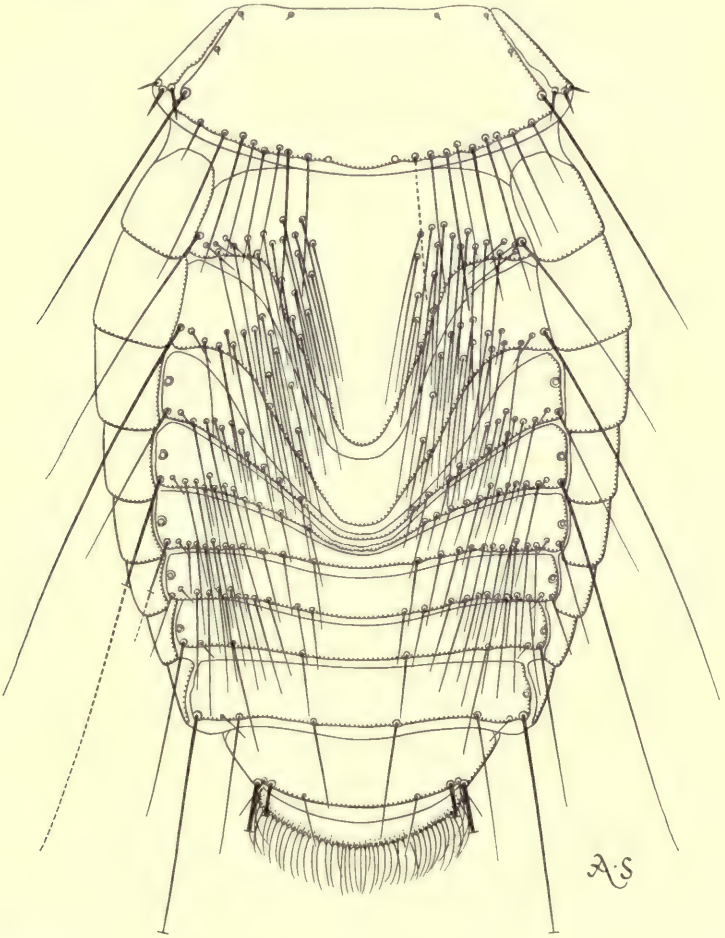

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FIG. 33. *Myrsidea devastator.* ♀, dorsal. Allotype.

Material examined. 2 ♂, 11 ♀ (C.C.) from the type host, *Turdus s. serranus*, from the type locality, PERU: Palambla, as follows: ♂ holotype, 2 ♀ paratypes (allotype ♀ not marked) on type slide, 23.vi.1933 (*M. A. Carriker*, no. 6719); 2 ♀ paratypes, 23.vi.1933 (*M. A. Carriker*, no. 6718); 1 ♂, 6 ♀ on slides with data as that of holotype but not seen by Ansari. Utcubamba, 1 ♀, 24.iv.1932 (*M. A. Carriker*, no. 4807), C.C.

*Measurements*

| | ♀ | | | |
|---|---|---|---|---|
| | Length | | Breadth | |
| | Paratype | Range | Paratype | Range |
| Head 1 | | (6) | 0·38 | 0·37–0·39 |
| Head | 0·34 | 0·32–0·35 | | |
| Head 2 | | | 0·54 | 0·51–0·54 |
| Prothorax | .. | .. | 0·32 | 0·30–0·33 |
| Metanotum | .. | .. | 0·51 | 0·47–0·53 |
| Abdomen | 0·92 | 0·85–0·95 | 0·57 | 0·56–0·60 |
| Total | 1·72 | 1·60–1·73 | .. | .. |

Aster (7), Sternite II.

| | | |
|---|---|---|
| Outer | 0·034–0·042. | Mean 0·038 |
| Inner | 0·092–0·116. | Mean 0·101. |

| | ♂ | | | |
|---|---|---|---|---|
| | Length | | Breadth | |
| | Holotype | Topotype | Holotype | Topotype |
| Head 1 | | | 0·34 | 0·35 |
| Head | 0·31 | 0·32 | | |
| Head 2 | | | 0·46 | 0·48 |
| Prothorax | .. | .. | 0·28 | 0·28 |
| Metanotum | .. | .. | 0·36 | 0·38 |
| Abdomen | 0·73 | 0·73 | 0·47 | 0·50 |
| Total | 1·42 | 1·42 | .. | .. |

### ***Myrsidea indigenella*** Ansari, 1956

(Text-figs. 11, 34, 54, 69)

Type host: *Turdus maranonicus* Taczanowski.

*Myrsidea indigenella* Ansari, 1956: 165, fig. 1. Host: *Turdus maranonicus*.

This species is distinguished in the female by the characters of the anterior abdominal terga (Text-fig. 34) and in the male from the two previous species by the greater number of tergocentral setae on VII and if constant, by 5 not 4 outer dorsal tibial setae.

♀ and ♂. The single female has abnormal setae on one side of the prothorax (3 + 1), metanotum and metasternal plate (2 + 3). It has not been possible to find the measurements of the head of the male holotype as given in Ansari (1956 : 165) and hence the cephalic index as given in the first couplet of the key to the species ( : 164) ; specimens of other species show similar proportions and are not separable on this character. Setae of latero-ventral fringe 11 + 11. Female metanotum lacks the long seta on one side ; central setae : 2 + 4 ; male 4 + 5. Outer dorsal setae of first tibiae in single female probably 5 + 6 and in the male 5 on at least one side. Setae of femoral brush : 22 + 23 (♀) ; 19 + 20 (♂). Female abdominal sternites IV–VI arched. The genital sclerite (Text-fig. 69) in the single male is distorted but the terminal portion is long and apparently not swollen distally.

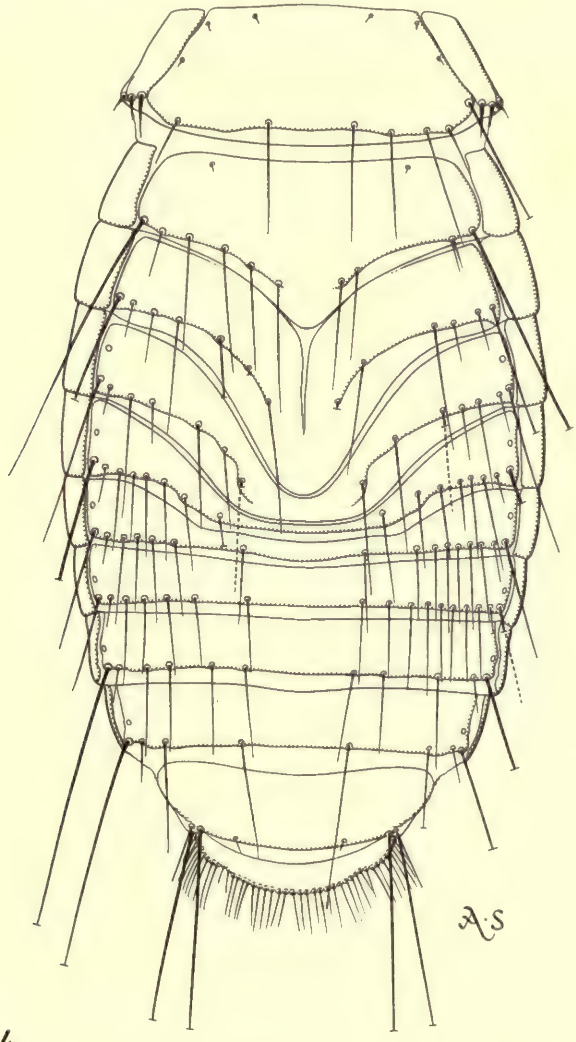

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FIG. 34. *Myrsidea indigenella*. ♀, dorsal. Allotype.

Abdominal Chaetotaxy. Tergal setae in single female as in Text-fig. 34. In male tergocentral setae : I, 12 ; II, 10 ; III, 14 ; IV, 13 ; V, 13 ; VI, 12 ; VII, 9 ; VIII, 4. Terminal segments as in Text-fig. 54. Sternal setae in female : II, ?4 anterior, 16 marginal and 4 + 3 in the aster ; III, 8 (3) + 9 + 5 (1) = 18 marginal ; IV, 14 (7) + 9 + ? ; V, 15 (8) + 9 + 15 (8) = 23 ; VI, 10 (4) + 9 + 8 (3) = 20 ; VII, 4 (1) + 2 + 3 (1) = 7 ; VIII–IX, ? + 5 ; vulva, 6 + 7. In the male : II, 8 anterior, 16 marginal, 4 + 4 spines ; III, 6 (1) + 12 + 5 (1) = 21 marginal ; IV, 11 (5) + 9 + 12 (6) = 21 ; V, 11 (6) + 10 + 13 (7) = 21 ; VI, 10 (5) + 7 + 11 (5) = 18 ; VII, 5 (1) + 7 + 2 (0) ; VIII 5 + 5 ; IX, 8. There is no trace in the single male of the long seta usually found each side of the ventral posterior margin.

Material examined. Holotype ♂, allotype ♀ from *Turdus maranonicus* from Peru : Tamborapa, 12.vii.1933 (*M. A. Carriker*, no. 6950), C.C. This slide is labelled " Holotype, Allotype " but without specific name.

*Measurements*

| | ♀ | | ♂ | |
|---|---|---|---|---|
| | Length | Breadth | Length | Breadth |
| Head 1 | 0·35 | 0·38 | 0·33 | 0·34 |
| Head 2 | | 0·53 | | 0·46 |
| Prothorax | .. | 0·30 | .. | 0·29 |
| Metanotum | .. | 0·45 | .. | 0·38 |
| Abdomen | 0·90 | 0·57 | 0·75 | 0·050 |
| Total | 1·66 | .. | 1·44 | .. |

## *Myrsidea abidae* Ansari, 1956

Pl. II, fig. 4 ; Text-figs. 2, 24, 35, 51, 70)

Type host : *Turdus fumigatus aquilonalis* (Cherrie).

*Myrsidea abidae* Ansari, 1956 : 171, fig. 7. Host : *Turdus fumigatus aquilonalis.*

This species is distinguished in the female by the form of the abdominal terga (Text-fig. 35) and in the male by a combination of the characters of the tergocentral chaetotaxy and genital sclerite.

♀ and ♂. Setae of latero-ventral head fringe : ♀, 11–12 ; ♂, 10–11. Central marginal setae of metanotum : ♀, 12–13 ; ♂, 8–10. Outer dorsal setae of first tibia 5–6. Setae of femoral brush : ♀, 23–24 ; ♂, 17–18. Female abdominal sternites VI–VII arched. Male genital sclerite (Text-fig. 70) with long terminal portion not swollen distally.

Abdominal Chaetotaxy. Tergocentral setae of female allotype and paratype : I, 11 ; 9. II, 11 ; 12. III, 17 ; 16. IV, 21 ; 16. V, 19 ; 22. VI, 19 ; 16. VII, 14 ; 11. VIII, 4 ; 4. Of male lectotype and paratype : I, 14 ; 10. II, 15 ; 12. III, 17 ; 15. IV, 18 ; 15. V, 18 ; 15. VI, 18 ; 14. VII, 14 ; 11. VIII, 7 ; 4. Including 5 specimens from British Guiana, the range of tergocentral setae in the male on VII is 9–14, mean (7) 11·6 and on VIII is 4–7, mean (6) 4·8. Posterior segments as in Text-fig. 51. Size of central gap in line of tergocentral setae varies between the two specimens and on different segments. Sternal setae : ♀, II (including British Guiana specimens), 5–10 anterior, 14–20 marginal and 4–5 in aster ; III–IX in Tables III and IV. ♂, II, 8 anterior, 17 marginal and 4 + 4 in aster; III–IX in Tables V and VI. The division between the marginal setae of the brush and the central setae is not always well marked.

Material examined. 2 ♂, 2 ♀, 3 nymphs on type slide (ticked by Ansari) from *Turdus fumigatus aquilonalis*, VENEZUELA: La Punta, 7.iv.1910 (*M. A. Carriker*, no 6946), C.C. From *Turdus f. fumigatus* Lichtenstein, from BRITISH GUIANA, Kanuku Mts., Rupununi, 6 ♂, 5 ♀, 21 and 24.ii.1961 (*T. Clay*, nos. 152, 169), B.M. (N.H.).

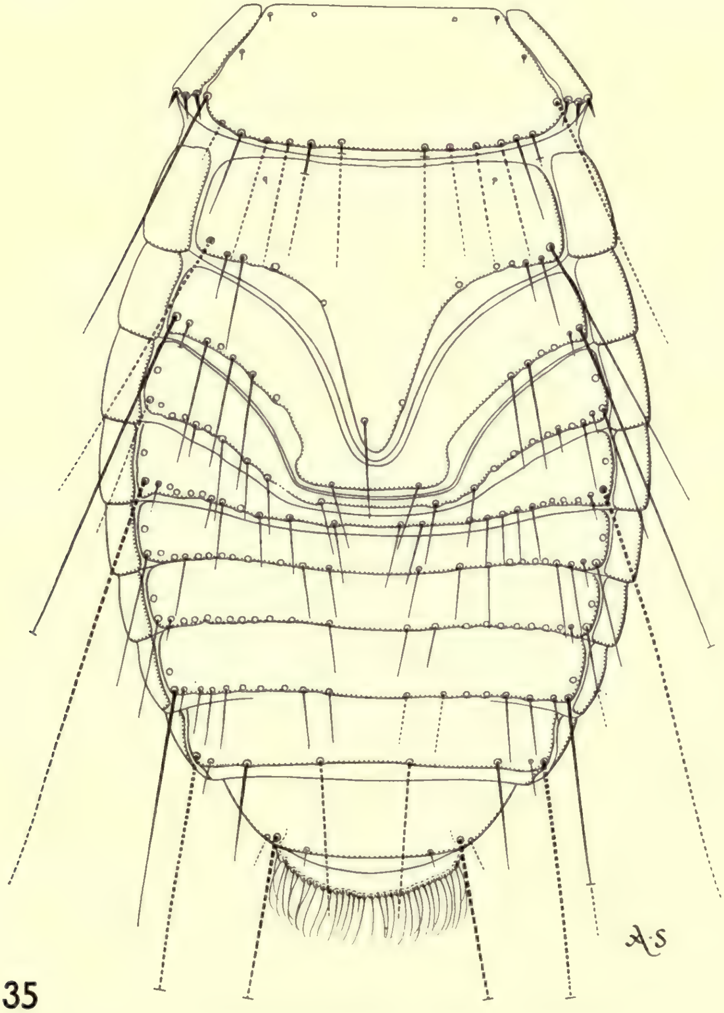

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FIG. 35. *Myrsidea abidae*. ♀, dorsal. Allotype.

LECTOTYPE by present designation: ♂ selected from two on type slide. *Allotype*: ♀ as designated by Ansari: 172: " female, central row ".

*Measurements*

| | | ♀ | | ♂ | |
|---|---|---|---|---|---|
| | | Length | Breadth | Length | Breadth |
| Head | 1 | 0·29 | 0·39 | 0·31 | 0·33 |
| | 2 | | 0·54 | | 0·46 |
| Prothorax | | .. | 0·33 | .. | 0·29 |
| Metanotum | | .. | 0·43 | .. | 0·42 |
| Abdomen | | 0·95 | 0·65 | 0·71 | 0·49 |
| Total | | 1·74 | .. | 1·37 | .. |

## ***Myrsidea regius*** Ansari, 1956

(Text-figs. 12, 20–22, 36, 53, 71)

Type host: *Turdus fumigatus obsoletus* Lawrence.

*Myrsidea regius* Ansari, 1956: 174, fig. 9. Host: *Turdus fumigatus obsoletus*.

This species is distinguished from *abidae* in the female by the characters of the anterior abdominal terga (Text-fig. 36) and in the male by the details of the genital sclerite and usually by the length of the two central setae on tergite VIII.

♀ and ♂. Setae of latero-ventral head fringe: 11–12. Central marginal setae of metanotum: ♀, 6–7 each side; mean of total (including Trinidad specimens) (6) 12·7. ♂, 5–6 each side (4–6 including Trinidad specimens); mean of total (6) 10·7. Outer dorsal setae of first tibia: 5–6. Setae of femoral brush: ♀, 20–22, mean (8) 20·9; ♂, 18–20, mean (6) 19·2. Female abdominal sternites V and VI arched. Male genital sclerite (Text-fig. 71) with long terminal part somewhat tapering distally.

Abdominal Chaetotaxy. Tergocentral setae, ♀ (five specimens including one from Trinidad), I, 11–12, mean 11·6; II, 11–14, mean 12; III, 13–18, mean 16·4; IV, 16–20, mean 18·2; V, 15–21, mean 18·6; VI, 17–20, mean 18·8; VII, 17–18, mean 17·2 in 4 Costa Rica specimens, 14–18, mean 16·5 in 4 Trinidad specimens; VIII, 10–13, mean (8) 11·1. The inner posterior setae on the last tergum vary in size and number (Text-figs. 20–22). One of the topotype males shows a greater number of tergocentral setae, especially on segments IV–V on which the central gap is eliminated, and on some sternal segments; the chaetotaxy of this specimen is given separately from the holotype, paratype and 4 Trinidad specimens, in case it should prove to be a straggler from another host. Tergocentral setae: 6 ♂, I, 9–11, mean 10·2; II, 11–12, mean 11·5; III, 12–16, mean 14·0; IV, 12–17, mean 14·5; V, 12–16, mean 15·2; VI, 14–18, mean 15·7; VII, 11–16, mean 13·5; VIII, 6–10, mean 8·7. Topotype male I, 16; II, 15; III, 20: IV, 26; V, 26; VI, 23; VII, 20; VIII, 11. This specimen also differs from the holotype in having the central setae of VIII much shorter and similar to those of *abidae*, although one of the Trinidad males approaches it in this character; however, in all the Trinidad specimens these setae reach beyond the end of the abdomen. Except for the holotype all the rest of the specimens from the type locality have these setae broken. Before deciding on the status of this single specimen further material is required to assess the amount of variation of these characters. Sternal setae: ♀, II, 10 anterior, 16 marginal and 5 + 5 in the aster (range 4–5); III–XI see Tables III and IV. ♂, II, 11 anterior, 15 marginal and 4 + 4 spines; III–XI see Tables V and VI. Abnormal topotype male : II, 22 anterior, 18 marginal and 4 + 4 spines ; III, 10 (5) + 17 + 11 (5) = 28 marginal ; IV, 14 (7) + 15 + 15 (8) = 29 ; V, 15 (6) + 13 + 19 (11) = 30 ; VI, 14 (7) + 12 + 16 (8) ; VII, 6 (1) + 5 + 4 + 5 (1) = 18 ; VIII, 12 ; IX, 14. Pleural setae of VIII may be 3 + 3, 3 + 4 or 4 + 4 (♀) and 3 + 3 or 3 + 4 (♂).

Material examined. 4 ♂, 5 ♀ from the type host individual *Turdus fumigatus obsoletus*, COSTA RICA : Juan Vinas, 12.v.1907 (*M. A. Carriker*, no. 3321), C.C. as follows : holotype ♂, allotype ♀ ; paratypes 1 ♂, 1 ♀ ; topotypes 2 ♂, 3 ♀ (not seen by Ansari). From the same host, COSTA RICA : Quapiles, 4 ♀, iii.1903 (*M. A. Carriker*), C.C. From *Turdus fumigatus aquilonalis* (Cherrie), TRINIDAD : Cumuto, 7 ♂, 9 ♀, 3.v.1960 (*T. H. G. Aitken*, TRVL, 4321), B.M. (N.H.) and TRVL. 3 ♀ from a *Turdus n. nudigenis*, TRINIDAD : Aripo Valley, 14.i.1961 (*T. Clay*, no. 29) belong to this species.

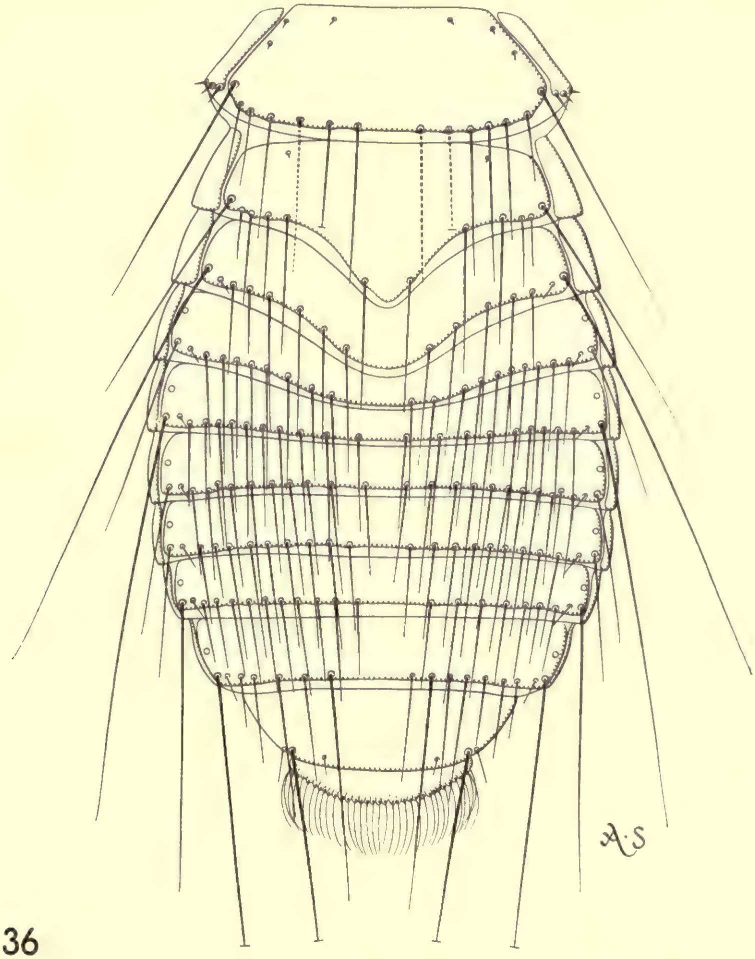

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FIG. 36. *Myrsidea regius*. ♀, dorsal. Allotype.

*Measurements*

| | ♀ | | | | | |
|---|---|---|---|---|---|---|
| | Length | | | Breadth | | |
| | | Range (8) | Mean | | Range (8) | Mean |
| Head 1 | 0·34 | 0·33–0·35 | 33·9 | 0·38 | | |
| Head 2 | | | | 0·53 | 0·51–0·55 | 0·53 |
| Prothorax | . . | . . | . . | 0·33 | . . | . . |
| Metanotum | . . | . . | . . | 0·44 | . . | . . |
| Abdomen | 0·90 | . . | . . | 0·59 | . . | . . |
| Total | 1·64 | . . | . . | . . | . . | . . |

| | ♂ | | | | | |
|---|---|---|---|---|---|---|
| | Length | | | Breadth | | |
| | | Range (7) | Mean | | Range (7) | Mean |
| Head 1 | 0·31 | 0·30–0·32 | 0·31 | 0·34 | | |
| Head 2 | | | | 0·48 | 0·45–0·48 | 0·47 |
| Prothorax | . . | . . | . . | 0·29 | . . | . . |
| Metanotum | . . | . . | . . | 0·35 | . . | . . |
| Abdomen | 0·65 | . . | . . | 0·48 | . . | . . |
| Total | 1·32 | . . | . . | . . | . . | . . |

### ***Myrsidea varia*** Ansari, 1956

(Pl. II, fig. 7 ; Text-figs. 14, 37, 55, 73)

Type host : *Turdus ignobilis debilis* Hellmayr.

*Myrsidea varia* Ansari, 1956 : 172, fig. 8. Host : *Turdus ignobilis debilis*.

This and the next two species (*simplex* and *rohi*) are placed together as in all three the male genital sclerite has the posterior portion short and enlarged distally. It is distinguished in both sexes by the greater number of outer lateral dorsal setae on the first tibia ; in the female by the form of the anterior terga ; in the male by the details of the genital sclerite, the greater length of the inner tergo-central seta on VIII and from *rohi* also by its larger size.

♀ and ♂. Setae of latero-ventral head fringe : ♀, 11 ; ♂, 10–11. Central marginal setae of metanotum : ♀, 5 + 6 ; ♂, 4–5 each side. Outer dorsal setae of first tibia : ♀, 6 + 6 ; ♂, 6 + 5. Setae of femoral brush : ♀, 22 + 21 ; 3 ♂, 16–18. Female abdominal sternites VI–VII arched. Male genital sclerite (Text-fig. 73), with posterior part shortened and greatly enlarged.

Abdominal Chaetotaxy. Post-spiracular seta VII is missing in the single female, in the male it is long and similar to VIII. Tergo-central setae : ♀, Text-fig. 37 ; 3 ♂, I, 10–14, mean 11·7 ; II, 8–11, mean 9·7 ; III, 10–12, mean 11·3 ; IV, 11–14, mean 12·3 ; V, 11–12, mean 11·7 : VI, 9–12, mean 11 ; VII, 7–8, mean 7·3 ; VIII in all specimens 2 + 2 ; the central seta each side is usually longer and stouter than the one next to it. Lengths of setae of posterior segments as in

Text-fig. 55. Sternal setae : ♀, II, 8 anterior, 16 marginal and 4 + 4 in aster ; III, 6 (1) + 12 + 5 (1) = 21 marginal ; IV, 14 (7) + 10 + 15 (8) = 24 ; V, 13 (6) + 7 + 15 (8) = 21; VI, 9 (4) + 7 or 8 + 9 (4) = 17 or 18 ; VII, 4 (1) + 2 + 2 + 3 = 10 ; VIII–IX, 5 + ? ; vulva, 13. ♂, II, 6–8 anterior, 12–16 marginal and 3–4 setae in aster ; III–IX see Tables V and VI.

Material examined. Holotype male, allotype female and two male paratypes from *Turdus ignobilis debilis*, PERU : Huacamayo, 26.vii.1931 (*M. A. Carriker*, no. 4200), C.C.

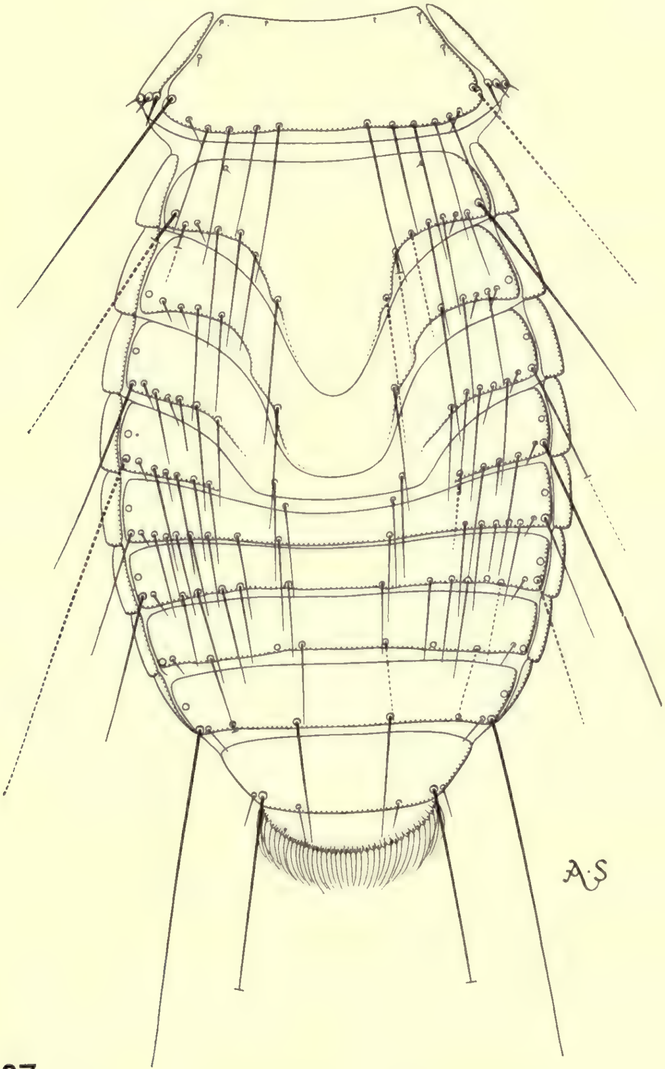

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FIG. 37. *Myrsidea varia.* ♀, dorsal. Allotype.

*Measurements*

| | ♀ | | ♂ | |
|---|---|---|---|---|
| | Length | Breadth | Length | Breadth |
| Head 1 | 0·34 | 0·37 | 0·32 | 0·34 |
| Head 2 | | 0·51 | | 0·46 |
| Prothorax | .. | 0·30 | .. | 0·28 |
| Metanotum | .. | 0·44 | .. | 0·36 |
| Abdomen | 0·88 | 0·57 | 0·70 | 0·45 |
| Total | 1·64 | .. | 1·37 | .. |

### ***Myrsidea rohi*** Ansari, 1956

(Plate II, fig. 6 ; Text-figs. 13, 38, 56, 74)

Type host : *Catharus g. gracilirostris* Salvin.

*Myrsidea rohi* Ansari, 1956 : 170, fig. 6. Host : *Catharus g. gracilirostris.*

This species is distinguished in the female by the great enlargement of the first abdominal tergum (Text-fig. 38) ; in the male from that of *simplex* by the details of the genital sclerite and from *varia* by the smaller size, details of the posterior chaetotaxy of the abdomen, the smaller number of setae in the femoral brushes and the genital sclerite.

♀ and ♂. Setae of latero-ventral head fringe : ♀, 8–9 ; ♂, 9–10. Central marginal setae of metanotum : ♀, 14–17 ; ♂, 8–10. Outer dorsal setae of first tibia : 4. Setae of femoral brush : ♀, 11–12 ; ♂, 10–12. Female abdominal sternites V–VI arched. Male genital sclerite (Text-fig. 74) similar to that of *varia* but smaller.

Abdominal Chaetotaxy. Post-spiracular seta VII in female shorter and finer than VIII, in male VII is somewhat longer than in female but still shorter and finer than VIII. Tergocentral setae : 2 ♀, I, 12 and 19. II, 15 and 18. III, 13 and 15. IV, 11 and 14. V, 11 and 12 + ?. VI, 9 and 13. VII, ? and 4 + 4. VIII, 2 + 2 and 2 + 2 ; tergites I–II have a few anterior setae each side (Text-fig. 38), these are included in the counts of the tergocentral setae. ♂, Table II ; there is a well marked central gap in the line of setae and the central seta each side is usually marked off from the rest by a definite gap (Text-fig. 56). Sternal setae : 2 ♀, II, 6 and 7 anterior ; 15 and 16 marginal ; 4 + 4 spines. III–XI as in Tables III and IV. ♂, II, 5 and 7 anterior (2) ; 10–12 marginal, mean (3) 11 ; spines 4 + 4 in all specimens. III–XI see Tables V and VI.

Material examined. 2 ♂, 1 ♀ on type slide from *Catharus g. gracilirostris*, COSTA RICA : Vol. Irazu, iv.1902 (*M. A. Carriker*, no. 4), C.C.

The holotype is not marked but in the original description it is stated that it has 12 setae in the femoral brush and as only one of the males has this number (on one side), this specimen has been labelled holotype ; the single female is the allotype. 1 ♂, 1 ♀, 2 nymphs (1 headless) on a second slide with the same data were seen by Ansari and the male and female are his paratypes. The other male and female paratypes listed by Ansari have not been seen.

*Measurements*

| | | ♀ | | ♂ | | | |
|---|---|---|---|---|---|---|---|
| | | Length | Breadth | Length | | Breadth | |
| | | | | | Range (3) | | Range (3) |
| Head | 1 | 0·27 | 0·29 | 0·26 | 0·25–0·26 | 0·28 | |
| | 2 | | 0·39 | | | 0·36 | 0·36–0·37 |
| Prothorax | | . . | 0·25 | . . | . . | 0·23 | . . |
| Metanotum | | . . | 0·37 | . . | . . | 0·32 | . . |
| Abdomen | | 0·68 | 0·50 | 0·60 | . . | 0·39 | . . |
| Total | | 1·27 | . . | 1·12 | . . | . . | . . |

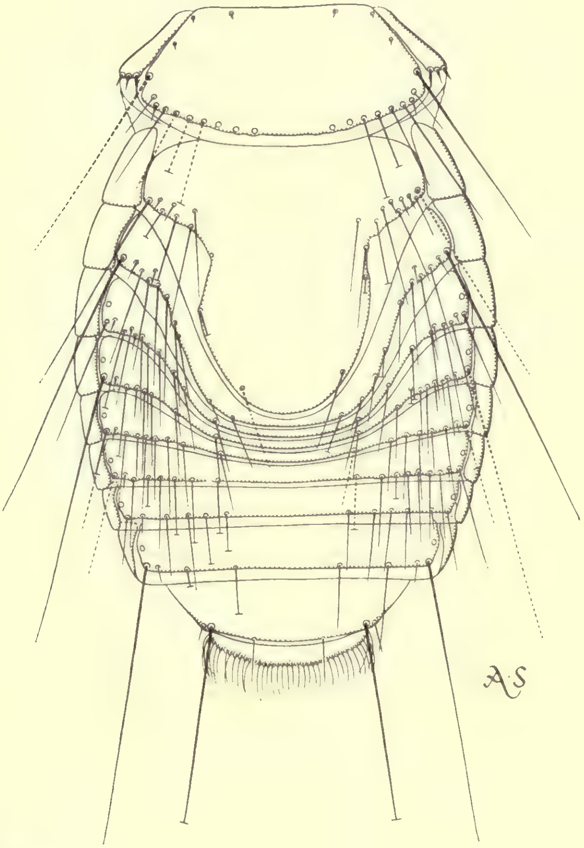

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FIG. 38. *Myrsidea rohi*. ♀, dorsal. Paratype.

## ***Myrsidea simplex*** Ansari, 1956

(Text-figs. 39, 57, 75)

Type host: *Catharus fuscater mentalis* Sclater & Salvin.

*Myrsidea simplex* Ansari, 1956 : 168, fig. 5. Host: *Catharus fuscater mentalis.*

This species is distinguished in the female by the pointed first tergite and form of terga II–IV (Text-fig. 39) and in the male from *varia* and *rohi* by the shape of the genital sclerite.

♀ and ♂. Setae of latero-ventral head fringe: 4 ♀, 9–11; ♂, 10 + 9. Central marginal setae of metanotum: ♀, 14–16, mean (4) 14·75; 1 ♂, 5 + 5. Outer dorsal setae of first tibia: 4.

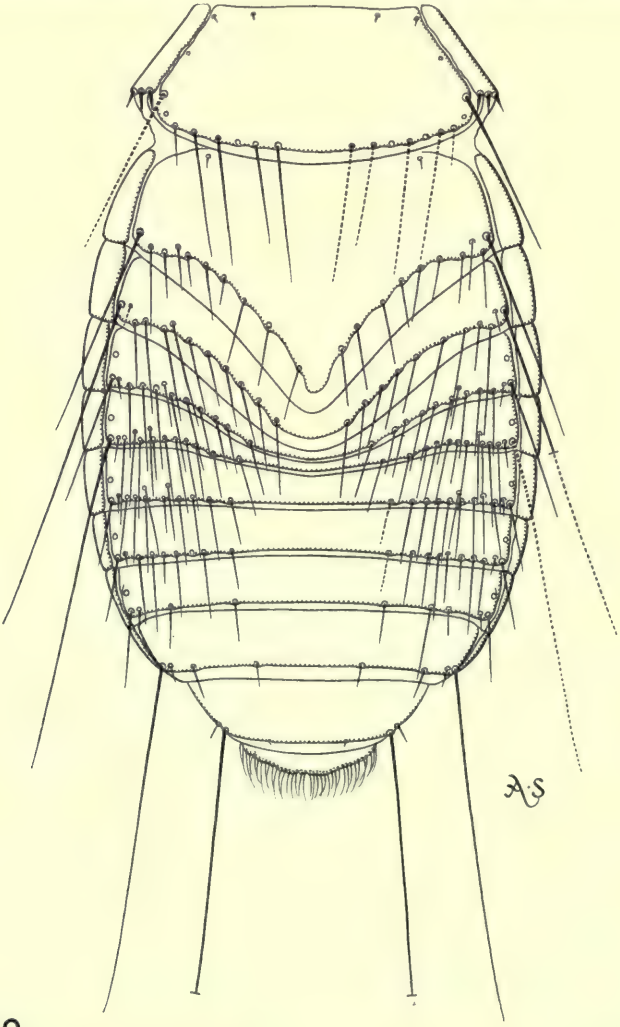

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Fig. 39. *Myrsidea simplex.* ♀, dorsal; thorax from paratype, abdomen from allotype.

Setae of femoral brush: ♀, 11–14, mean (10 legs) 12·8; 1 ♂, 13 + 14. Female abdominal sternites II–VI strongly arched. Male genital sclerite widest at posterior margin (Text-fig. 75).

Abdominal Chaetotaxy. Post-spiracular seta VII in female as short and fine as VI, in the male it is somewhat longer and stouter, but short and finer than VIII. Tergocentral setae: 5 ♀, I, 14–18, mean 16·2; II, 15–19, mean 16·8; III, 18–20, mean, 19; IV, 19–23, mean 21; V, 18–23, mean 20·8; VI, 12–16, mean 14·2; VII, 4–7, mean 5·4; VIII always 2 + 2. On segments I–VI there may be 1–4 anterior setae each side, these have been included in the above counts. ♂, I, 4 + 4, II, 6 + 5; III, 7 + 6 or 7; IV, 5 + 5; V, 6 + 5; VI, 3 + 4; VII, 3 + 2; VIII, 2 + 2; there is a marked gap between the setae of the two sides and on IV–VIII the central setae are definitely separated from the rest (Text-fig. 57). Sternal setae: ♀, II, 5 anterior, 14–16 marginal and 4 + 4 in aster; III–XI, Tables III and IV; there is a marked gap between central setae and those of the brushes. ♂, II, 9 anterior, 15 marginal and 4 + 4 in aster; III, 3 (0) + 10 + 4 (0); IV, 10 (5) + 7 + 10 (4); V, 9 (3) + 8 + 9 (3); VI, 9 (3) + 8 + 8 (3); VII, 4 (1) + 7 + 4 (1); VIII, 4 + 4; IX–XI, ?8.

Material examined. Holotype male, allotype female and two female paratypes from *Catharus fuscater mentalis*, PERU: Oconeque, 3.vi.1931 (*M. A. Carriker*, no. 3301), C.C. There is also another slide 3301 with the same data in the Carriker collection (not seen by Ansari) with 1 ♂, 2 ♀. The two females are conspecific with *simplex*, but the male differs in the form of the genital sclerite and in having the post-spiracular seta VII long and stout; it is possibly a straggler from another host.

*Measurements*

♀

| | | | Length | | | Breadth | |
|---|---|---|---|---|---|---|---|
| | | | Range (4) | Mean | | Range (4) | Mean |
| Head | 1 | 0·30 | 0·290–0·300 | 0·297 | 0·34 | 0·33–0·34 | 0·333 |
| | 2 | | | | 0·47 | 0·45–0·47 | 0·460 |
| Prothorax | | .. | .. | .. | 0·28 | 0·26–0·28 | 0·270 |
| Metanotum | | .. | .. | .. | 0·42 | .. | .. |
| Abdomen | | 0·76 | .. | .. | 0·53 | .. | .. |
| Total | | 1·50 | .. | .. | .. | .. | .. |

♂

| | | | |
|---|---|---|---|
| Head | 1 | 0·27 | 0·31 |
| | 2 | | 0·42 |
| Prothorax | | .. | 0·25 |
| Metanotum | | .. | 0·32 |
| Abdomen | | 0·62 | 0·42 |
| Total | | 1·22 | .. |

## *Myrsidea montana* sp. n.

(Pl. I, fig. 7: Text-figs. 40, 41, 58)

Type host: *Zoothera gurneyi otomitra* (Reichenow).

This species is distinguished in the female by the form of the anterior abdominal terga (Text-fig. 40) and the presence of anterior median setae on sternites III–VI; in the male by the elongated genital sclerite.

♀ and ♂. Setae of latero-ventral head fringe: 10–12, mean (10), 11·1; seta 10 usually over half length of 11 (ratio 10/11 ♀, 0·535–0·615; ♂, 0·575–0·695). Central marginal setae of metanotum 2 ♀, 6 + 8, 6 + 6; ♂, 3–5 each side, mean of total (8): 7. Outer dorsal setae of first tibia; 2 ♀, 6 + 6, 7 + 6; ♂ (16 legs), 5–6, mean 5·8. Setae of femoral brush: 2 ♀, ? + 19; 22 + 24; ♂ (14 legs), range 16–24, mean 19. In the female terga II and III are divided medianly by the prolongation of I, in the holotype (Text-fig. 41) a small part of the inner end of II appears to be separated by a distinct suture (a.), but this is not apparent in the other female. Sternites V–VI in female strongly arched. Male genital sclerite with part posterior to the arms elongated (Pl. I, fig. 7).

Abdominal Chaetotaxy. Tergocentral setae: ♀, Text-fig. 40; ♂, Table II. Sternal setae: 2 ♀, II, 4 anterior, 17–19 marginal and 4 + 4 and 4 + 5 in the aster, the inner seta in both sexes is long (see measurements); sternites III–IX: 1 ♀, III, 17 (12) + 17 + 16 (11); IV, 17 (11) + 16 + 18 (12); V, 16 (8) + 15 + 15 (8); VI, 9 (3) + 11 + 9 (4); VII, 3 (1) + 8 + 3 (2); VIII, 7 + 6; IX, 7 + 8; 2 ♀, 14 and 16 vulval setae. 10 ♂, II, 2 anterior, 12–16 marginal and 3 + 4 (1) and 4 + 4 (9) in the aster; III–IX, Tables V and VI. Both females have anterior

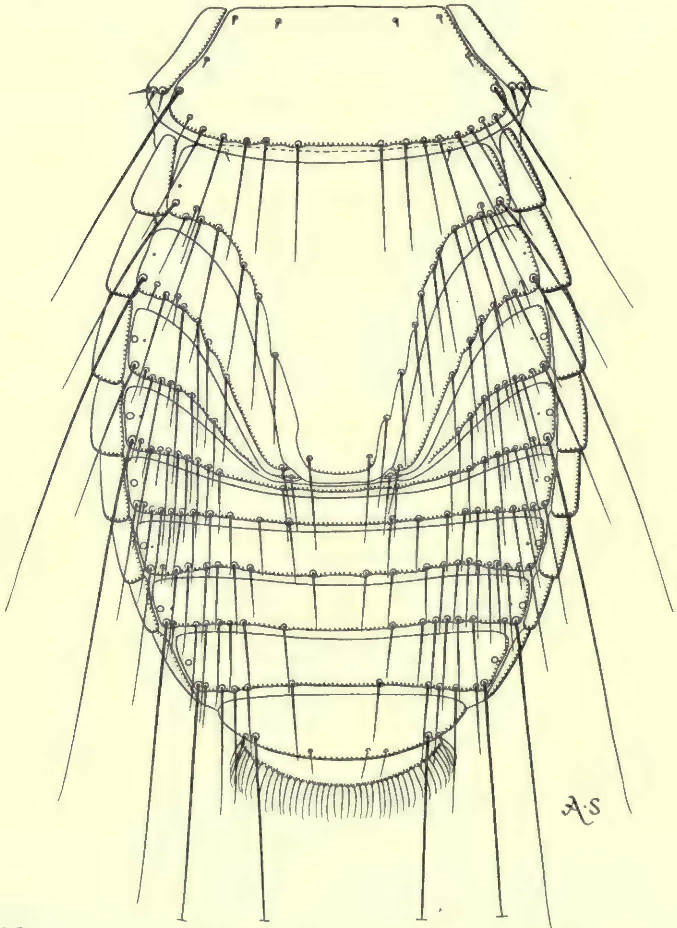

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Fig. 40. *Myrsidea montana*. ♀ dorsal. Holotype.

median setae, countable in only one specimen : sternite III, 18, IV, 16, V, 6 ; VI, 6. In the 10 males, one is damaged, 5 have no anterior setae ; 4 have the setae as follows : III, 2 : 1 : 4 : 0 ; IV, 3 : 2 : 0 : 1 ; V, 1 : 0 : 0 : 0. Pleural setae of a varying number of segments III–VII have 1–3 rather long inner setae reaching to or beyond the end of the next pleurite. Pleurite VIII : ♀, 4 + 4, 3 + 3, ♂, 3 + 3 setae.

Material examined. 10 ♂, 2 ♀ from *Zoothera gurneyi otomitra*, TANGANYIKA : Amani, vii.1935 (*R. E. Moreau*), B.M. (N.H.) No. 4313.

Holotype female and allotype male (slides 4313 a. and 4313 b.).

Paratypes : 9 ♂, 1 ♀ (slides no. 4313) from type host with data as given above.

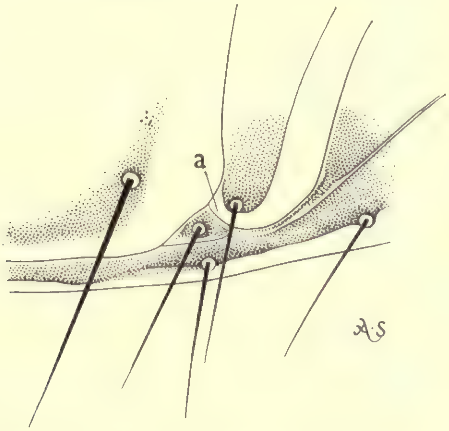

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FIG. 41. *Myrsidea montana*. ♀, parts of tergites I–III enlarged. Holotype.

*Measurements*

| | ♀ | | ♂ | | | |
|---|---|---|---|---|---|---|
| | Length | Breadth | Length | | | Breadth |
| | | | | | Range | Mean |
| Head 1 | 0·32 | 0·37 | 0·30 | 0·32 | | |
| Head 2 | | 0·50 | | 0·43 | 0·42–0·43 | 0·427 (6) |
| Prothorax | . . | 0·32 | . . | 0·28 | . . | . . |
| Metanotum | . . | 0·43 | . . | 0·34 | . . | . . |
| Abdomen | 0·83 | 0·59 | 0·54 | 0·44 | . . | . . |
| Total | 1·55 | . . | 1·19 | . . | . . | . . |
| Inner spine of st. II | 0·144–0·148 (3) | | 0·094–0·128, mean (16 )0·108 : S.D.0·01 | | | |

## THE *CARRIKERI* SPECIES GROUP

1–3. As in *thoracica* group. Shape of head similar within the group (Pl. II, fig. 3).
4. Pronotum normally with 4 + 4 long posterior marginal setae.
5–6. As *thoracica* group.
7. Post-spiracular setae VII long but noticeably shorter and finer than VIII.
8–11. As *thoracica* group.

The four species comprising this group may not form a natural assemblage but for convenience are placed together on the number of pronotal marginal setae and the deep emargination of the anterior margin of tergite I. *M. antiqua* is separated in the female from the other three species and from all other species discussed here by the form of the comb-like projections of the inner surface of the genital chamber (Text-fig. 23). The females are distinguished from each other by the shape and size of tergites I–III ; *aitkeni* sp. n. differs only slightly from *antiqua* in these characters but is easily distinguished by the internal thickening of the genital chamber. When it is possible to examine undistorted male genital sclerites, *antiqua*, *carrikeri* and *elegans* are separable on the characters of these structures ; those of *aitkeni* and *antiqua* appear to be indistinguishable, in fact it seems doubtful if males of these two species can be separated. In the material examined, *elegans* males have a greater number of tergocentral setae : totals on I–VII, 157–181 compared to 114–140 in *carrikeri*, 103–120 in *antiqua* and 97–126 in *aitkeni*. Thus, it is probable that a male with more than 150 setae on I–VII is *elegans*.

## ***Myrsidea carrikeri*** (Eichler, 1943)

(Pl. II, fig. 3 ; Text-figs. 3, 15, 42, 59, 76)

Type host : *Turdus grayi casius* (Bonaparte).

*Menopon thoracicum* var. *majus* Carriker, 1903 : 187, *nec Menopon major* Piaget, 1880. Host : *Merula grayi*.
*Menacanthus carrikeri* Eichler, 1943 : 59 [*nom. nov.* for *Menopon majus*].
*Myrsidea carrikeri* (Eichler) ; Ansari, 1956 : 175, fig. 11.

The original description of *majus*, which amounted only to measurements of one female, was based on one female from *Merula grayi* and one from *Tanagra cana*. The female from the former host has been labelled type by the author ; this specimen will here be designated as lectotype, thus fixing the type host as *Turdus grayi casius*. In addition to the female lectotype the descriptions and figures given here are based on 6 ♂ and 4 ♀ from the type host from Costa Rica.

♀ and ♂. Setae of latero-ventral head fringe : 10–12, with one female with 13 on one side. Central setae of metanotum each side : ♀, 6–8, mean (5) 7·6 ; ♂, 5–7, mean (6) 6·1. Outer setae of first tibia 5–7. Setae of femoral brush : ♀, 21–28, mean (9 legs) 24·2 ; ♂, 17–22, mean (8 legs) 19·1. Female abdominal sternites not markedly arched. Male genital sclerite elongated and flattened distally (Text-fig. 76).

Abdominal Chaetotaxy. In the female, post-spiracular seta VII is somewhat shorter and finer than VIII but not markedly so. Tergocentral setae : Tables I and II ; in the female the inner seta each side of VIII is usually longer than the rest ; the inner posterior setae of the last tergum may be 1 + 1 short (2 ♀) as in Text-fig. 42, 1 long + 1 short (1 ♀), 2 + 1, all short (1 ♀). In the male the central gap in the line of setae on II–VII may be present or absent. Sternal setae : 5 ♀, II, 12–22 anterior mean 17·4 ; 18–21 marginal mean 19·6 ; 4–5 in aster ; III–XI, (Tables III and IV) ; ♂, II, 10–12 anterior (2), 16 marginal (2) and 3–5 in aster (6) ; III–XI, (Tables V and VI). Pleural setae of VIII, 3 + 3 (3 ♀), 3 + 4 (2 ♀) ; 3 + 3 (6 ♂).

Material examined. 1 ♀, labelled type of *Menopon thoracicum majus* Carriker from *Turdus grayi casius*, COSTA RICA: Juan Vinas, iii.1902 (*M. A. Carriker*, no. 14), C.C. From same host, COSTA RICA: Guapiles, 6 ♂, 4 ♀, iii.1903 (*M. A. Carriker*), C.C.; 2 ♂, 1 ♀ of this lot seen by Ansari (1956 : 176).

LECTOTYPE of *Myrsidea carrikeri* by present designation: ♀ labelled *Menopon thoracicum majus* type with data as given above.

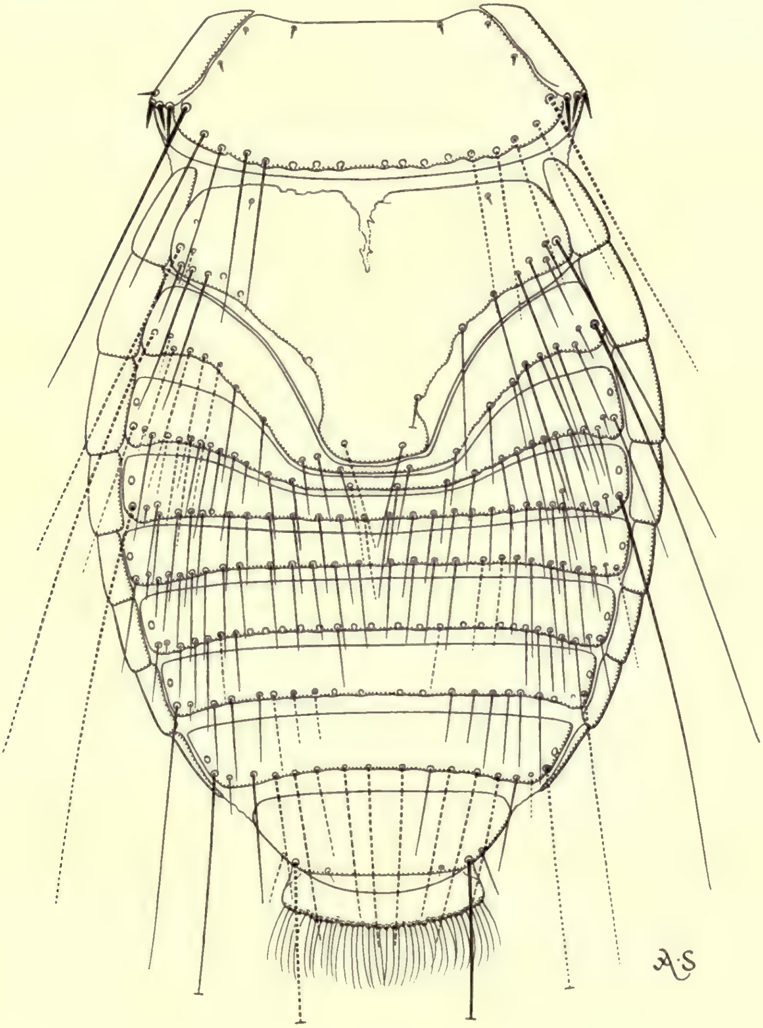

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FIG. 42. *Myrsidea carrikeri*. ♀, dorsal. Lectotype.

*Measurements*

| | | | ♀ | | | |
|---|---|---|---|---|---|---|
| | | | Length | | Breadth | |
| | | | Range (5) | Mean | Range (5) | Mean |
| Head | 1 | 0·35 | 0·34–0·36 | 0·35 | 0·39–0·41 | 0·406 |
| | 2 | | | | 0·56–0·58 | 0·570 |
| Prothorax | | . . | . . | . . | 0·34–0·35 | 0·346 |
| Metanotum | | . . | . . | . . | 0·50–0·51 | 0·508 |
| Abdomen | | 0·94 | . . | . . | 0·64–0·67 | 0·660 |
| Total | | 1·79 | . . | . . | . . | . . |

| | | | ♂ | | | |
|---|---|---|---|---|---|---|
| Head | 1 | 0·33 | 0·30–0·33 (5) | 0·32 | 0·34–0·36 | 0·350 |
| | 2 | | | | 0·47–0·50 | 0·486 |
| Prothorax | | . . | . . | . . | 0·29–0·31 | 0·300 |
| Metanotum | | . . | . . | . . | 0·36–0·38 | 0·370 |
| Abdomen | | 0·71 | . . | . . | 0·50 (1) | . . |
| Total | | 1·43 | . . | . . | . . | . . |

### ***Myrsidea antiqua*** Ansari, 1956

(Pl. I, fig. 4; Text-figs. 16, 23, 43, 60, 77)

Type host: *Turdus g. grayi* Bonaparte.

*Myrsidea antiqua* Ansari, 1956: 174, fig. 10. Host: *Turdus g. grayi.*

In the original description the type material was said to have come from " *Turdus g. grayi* Bonaparte, Mexico (Tlacotalpan Costa Rica), Carriker 212a and 212b February 15, 1940." Amongst the material seen by Dr. Ansari are two slides with this wording on the label except for " Costa Rica ", presumably added to the text in error. In addition there is a third slide in the Carriker collection, not seen by Dr. Ansari, with the same data and number (212); the two specimens on this slide presumably came from the same host individual as the type material.

♀ and ♂. Setae of latero-ventral head fringe: ♀, 11–12; ♂, 11–13. Central marginal setae of metanotum: 3 ♀, 6–8 each side; 4 ♂, 5–6. The available specimens have rather more metapleural setae than in the other species of this group: ♀, 3–7 each side, mean (23 sides)* 4·8 compared with *carrikeri* mean (8) 3·7 and *elegans* (1) 4 + 3; ♂, 3–6, mean (19)* 4·1 compared with *carrikeri* mean (6) 3·25 and *elegans* (10) 2·7. Outer dorsal setae of first tibia 5–6. Setae of femoral brush: ♀, 22–24, mean (5) 23·2; ♂, 19–22, mean (7) 20·7. The inclusion of 4 legs from the Trinidad specimens gives a range in the male of 17–22, mean (11) 20·2. Female abdominal sternite VI arched; sculpturing of genital chamber unlike any other found in the species from Turdinae (Text-fig. 23). Male genital sclerite long and narrow (Text-fig. 77).

* Includes Trinidad specimens from *Turdus fumigatus*.

Abdominal Chaetotaxy. Post-spiracular seta VII as in *carrikeri*. Tergocentral setae: Tables I–II; if the Trinidad males are included, the range is as follows: I, 11–15; II, 13–17; III, 15–17; IV–V, 14–21; VI, 12–20; VII, 11–18; VIII, 5–10; there is little difference in the means. In the male the line of setae on I–VII may be continuous without a central gap; the two central setae on VIII vary somewhat in length between specimens and on the two sides of the same specimen; they usually reach beyond the end of the abdomen. Sternal setae: 3 ♀ II, anterior 9–12, mean 10·7; marginal 15–16, mean 15·7; 4 + 4 in aster; III–IX in Tables III–IV. The sternal setae may have a central gap on V, VI or VII. 4 ♂, II, anterior 8–10, mean 9·25; marginal 12–16, mean 13·75; 4 + 4 setae in aster; III–IX in Tables V–VI. The line of sternal setae is continuous and the marginal setae of the lateral brushes distinguished only by a difference in the setae, not always obvious on all segments; on VII the similar setae form a continuous line, with 1–2 anterior setae laterally; on VIII the line may or may not show a central gap.

Material examined. Holotype ♂; allotype ♀; paratypes 2 ♂, 1 ♀; topotypes 1 ♂, 1 ♀ from *Turdus g. grayi*, MEXICO: Tlacotalpam, 15.ii.1940 (*M. A. Carriker*,

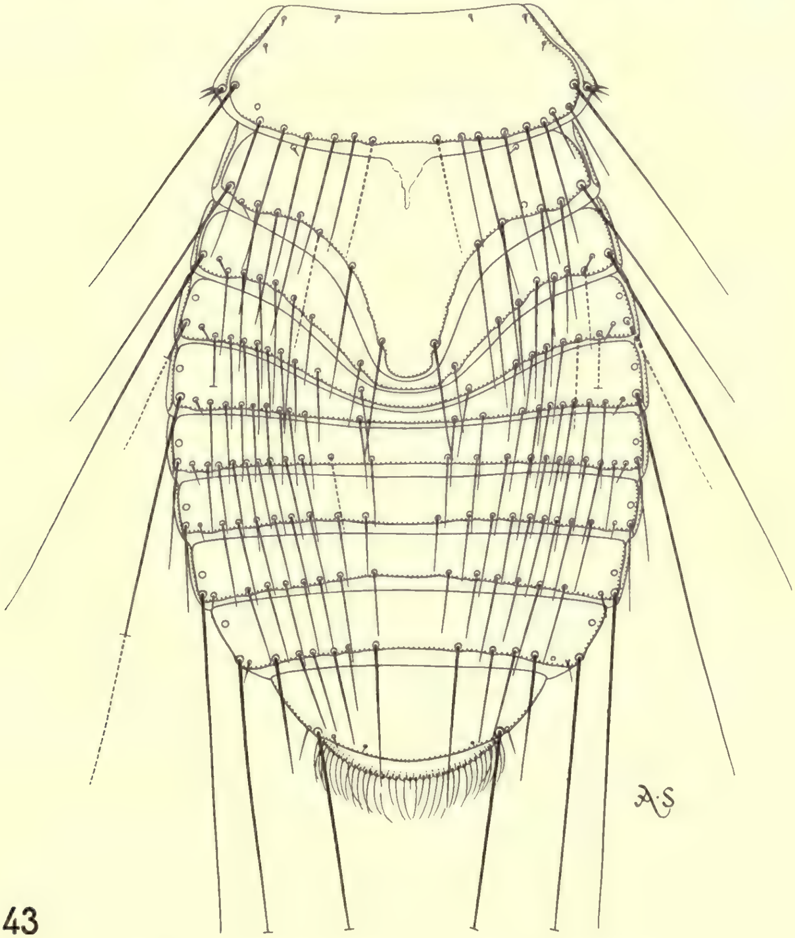

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FIG. 43. *Myrsidea antiqua*. ♀, dorsal. Allotype.

no. 212), C.C. From *Turdus fumigatus aquilonalis* (Cherrie), TRINIDAD : Cumuto, 3 ♂, 8 ♀, 17.v.1960 (*T. H. G. Aitken*, TRVL 4380) ; Vega de Oropouche, 5 ♂, 1 ♀, 15.xii.1959 (*T. H. G. Aitken*, TRVL 3742 and 3737) ; Arima Valley, 1 ♂, 1 ♀, 10.iii.1961 (*T. Clay*, no. 192), B.M. (N.H.).

*Measurements*

(Including Trinidad Specimens)

| | | ♀ | | | |
|---|---|---|---|---|---|
| | | Length | | Breadth | |
| | | Range | Mean | Range | Mean |
| Head | 1 | 0·33–0·36 | 0·35 (11) | 0·39–0·41 | 0·40 (10) |
| | 2 | | | 0·53–0·56 | 0·55 (10) |
| Prothorax | | .. | .. | 0·32–0·35 | 0·34 (11) |
| Metanotum | | .. | .. | 0·45–0·50 | 0·48 (10) |
| Abdomen | | 0·85–0·91 (4) | .. | 0·62–0·65 (3) | .. |
| Total | | 1·62–1·74 (4) | .. | .. | .. |

| | | ♂ | | | |
|---|---|---|---|---|---|
| | | | | | (10) |
| Head | 1 | 0·30–0·33 | 0·31 (10) | 0·35–0·36 | 0·356 |
| | 2 | | | 0·47–0·50 | 0·483 |
| Prothorax | | .. | .. | 0·29–0·31 | 0·308 |
| Metanotum | | .. | .. | 0·36–0·39 | 0·374 |
| Abdomen | | 0·70–0·76 (4) | .. | 0·50–0·53 (4) | .. |
| Total | | 1·38–1·43 (4) | .. | .. | .. |

## ***Myrsidea aitkeni* sp. n.**

(Text-fig. 44)

Type host : *Turdus n. nudigenis* Lafresnaye.

♀ and ♂. Number of setae of latero-ventral fringe, metanotum, first tibia and femoral brush fall within the range of those of *M. antiqua*. The metapleural setae average fewer : ♀, 3–5, mean (22 sides) 3·9 ; ♂, 2–5, mean (13) 3·5. The female genital chamber has the thickening normally found in the species from the Turdinae (Text-fig. 24) and differs from that in *antiqua*. The male genital sclerite appears similar to that of *antiqua*. The abdominal terga in the female differ slightly from those of *antiqua* (Text-fig. 44).

Abdominal Chaetotaxy. Post-spiracular VII as in other species of this group. The range of tergocentral setae in the female is so large that it cannot be used for specific separation : I, 11–14 ; II, 9–18, III, 9–28 ; IV, 13–28 ; V, 15–27 ; VI, 15–27 ; VII, 11–24 ; VIII, 8–14. Range and mean of tergocentral setae in male : I, 12–15, mean (5) 13 ; II, 11–15, mean 13·6 ; III, 15–21, mean 18·2 ; IV, 15–19, mean 17·6 ; V, 16–21, mean 17·8 ; VI, 15–19, mean 16·8 ; VII, 12–16, mean 14 ; VIII, 7–10, mean 8·2.

Material examined. 18 ♂, 24 ♀ from *Turdus n. nudigenis*, TRINIDAD : Cumuto, 26.iv.1960 (TRVL 4294, 4309), 3.v.1960 (TRVL 4320), 10.v.1960 (TRVL 4354), 17.v.1960 (4383) ; Caroni River, 4.i.1961 (5259) ; Sangre Grande, 5.xii.1958 (2118, 2123, 2127, 2128, 2130), (*T. H. G. Aitken*). 4 ♀ from a *Turdus fumigatus aquilonalis* (Cherrie), TRINIDAD : Arima Valley, 28.i.1959 (*T. H. G. Aitken*, 2285a) also belong to this species.

Holotype ♀, allotype ♂ on slide No. 686 from *Turdus n. nudigenis*, 26.iv.1964, TRVL4309 with data given above, B.M. (N.H.).

Paratypes: 17 ♂, 23 ♀ from *Turdus n. nudigenis* with above data. The males are included although at present indistinguishable from those of *antiqua*, as females of this latter species have not been found on *T. nudigenis*.

This species is named in honour of Dr. T. H. G. Aitken of the Trinidad Regional Virus Laboratory, Port of Spain, who has contributed so much towards the study of the ectoparasitic arthropods of Trinidad.

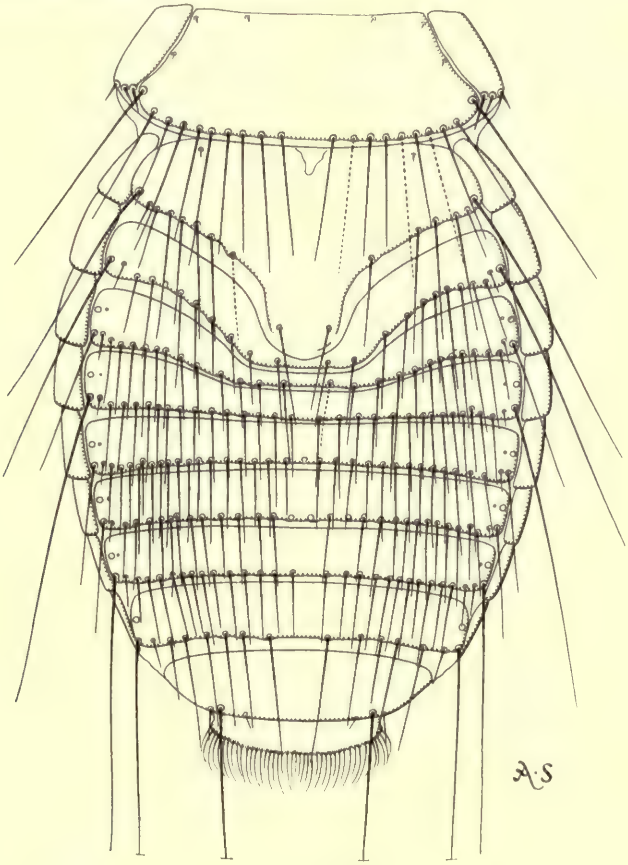

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FIG. 44. *Myrsidea aitkeni*. ♀, dorsal. Holotype.

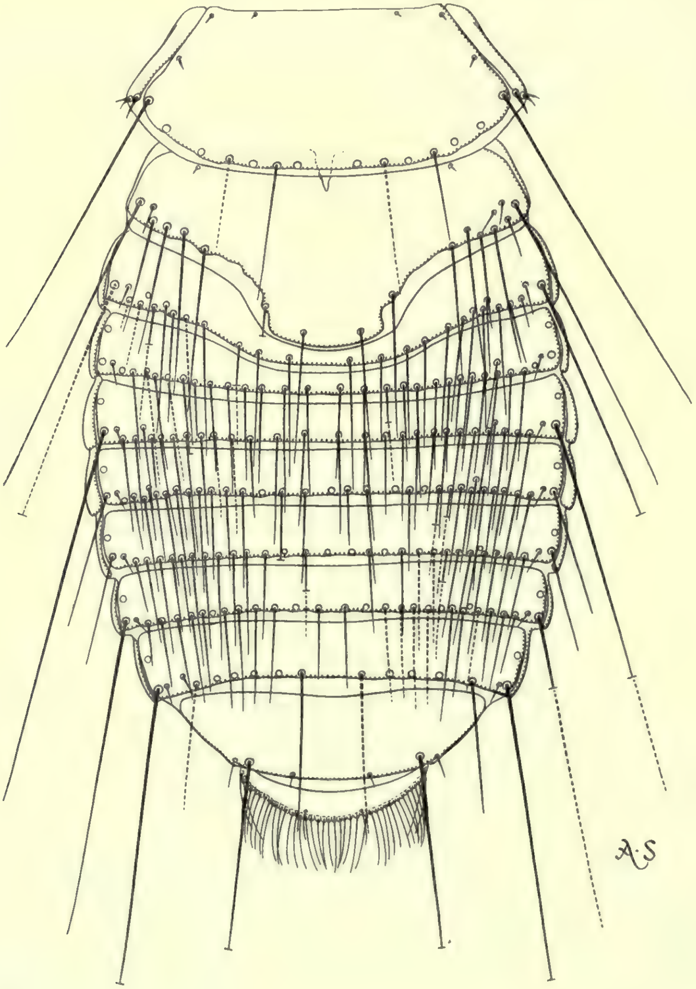
### ***Myrsidea elegans*** Ansari, 1956

(Text-figs. 17, 45, 61, 78)

Type host : *Turdus r. rufiventris* Vieillot.

*Myrsidea elegans* Ansari, 1956 : 176, fig. 12. Host : *Turdus r. rufiventris.*

The description of this species was based on four males ; in addition there are in the Carriker collection and not seen by Dr. Ansari, one male and one female with the data, including the number 16456, as given on the slide with the paratypes ; it can be assumed that these two specimens came from the same host individual as the paratypes.



45

FIG. 45. *Myrsidea elegans.* ♀, dorsal.

♀ and ♂. In the available material the number of gular setae averages somewhat higher than in the previous species; 10–12, mean (4) 10·75. Setae of latero-ventral head fringe: ♀, 11; ♂, 10–11, mean (5) 10·9. Central marginal setae of metanotum: ♀, 6 + 6; 5 ♂, 6–8 each side. Outer dorsal setae of first tibia: 5–6. Setae of femoral brush: ♀, 19 + 20 ♂, 19–21, mean (10) 19·8. Posterior abdominal sternites of female only weakly arched. Male genital sclerite similar to that of *carrikeri* but tapers to rounded distal end (Text-fig. 78).

Abdominal Chaetotaxy. Post-spiracular setae as in *carrikeri* but III is missing on both sides of the single female. Tergocentral setae of single female shown in Text-fig. 45; ♂, I, 18–22, mean (3) 19·60: II, 23–24, mean (4) 23·25; III, 22–27, mean (5) 24·80; IV, 27–28, mean 27·20 (5); V, 24–28, mean (5) 26·40; VI, 23–29, mean (5) 25·40; VII, 20–23, mean (5) 22·00; VIII, 5–6 + 5–6, mean (3) 11·66. On segments II–VIII there may be one or two anterior setae each end; these have been included in the above counts. On I–VII there is little or no gap in the line of setae. Sternal setae: ♀, II, 23 anterior, 20 marginal and 5 + 4 in aster: III, 11 (4) + 15 + 13 (8); IV, 16 (9) + 10 + 15 (8); V, 14 (7) + 15 + 16 (9); VI, 10 (4) + 10 + 11 (5); VII, 4 (1) + 5 + 6 + 5 (1); VIII–IX, 10 + 9; vulva 5 + 5. ♂, II, 8–10 (2) anterior, 17–18 (3) marginal and 4 + 4 in aster; III–XI, Tables V and VI.

Material examined. Syntypes: 2 ♂ from *Turdus r. rufiventris*, BOLIVIA: Samaipata, 28.x.1937 (*M. A. Carriker*, No. 16243); 2 ♂ from the same host and locality, 4.xi.1937 (*M. A. Carriker*, No. 16456), C.C. 1 ♂, 1 ♀ (not seen by Ansari) on slide numbered 16456 with the same data as above, C.C. On Slide No. 16243 with a pencil tick denoting holotype, are two males, one of which is damaged; the undamaged male is designated as lectotype below.

LECTOTYPE of *Myrsidea elegans* by present designation: ♂ on Slide No. 16243 with data as given above.

*Measurements*

| | ♀ | | ♂ | | | |
|---|---|---|---|---|---|---|
| | Length | Breadth | Length | | Breadth | |
| | | | Range (2) | | Range | Mean |
| Head 1 | 0·35 | 0·41 | 0·30–0·32 | 0·32 | 0·32–0·35 | 0·330 (3) |
| Head 2 | | 0·58 | | 0·48 | 0·48–0·50 | 0·490 (4) |
| Prothorax | .. | 0·34 | .. | 0·27 | 0·27–0·30 | 0·285 (4) |
| Metanotum | .. | 0·50 | .. | 0·36 | 0·36–0·37 | 0·365 (4) |
| Abdomen | 0·91 | 0·66 | 0·66–0·73 | 0·53 | .. | .. |
| Total | 1·71 | .. | 1·31–1·45 | .. | .. | .. |

## THE *ISHIZAWAI* SPECIES GROUP

1. Head as in *thoracica* group but the number of lateral fringe setae average more and there are 2–4 instead of one short straight seta between the end of the lateral fringe and the long ventral seta on each temple.
2. Number of gular setae average more.

3–5. As in *thoracica* group.

6. Outer dorso-lateral setae of first tibia over 14.
7. Post-spiracular setae III medium to long.

8–9. As *thoracica* group.

10. Spermatheca thin-walled and collapsed in mounted specimens.
11. Male genital sclerite characteristic (Text-fig. 72).

*Myrsidea pullula* (Piaget, 1890) based on a single male from *Oriolia berneieri* has a genital sclerite similar to that of *ishizawai*, but differs in characters 2 and 6.

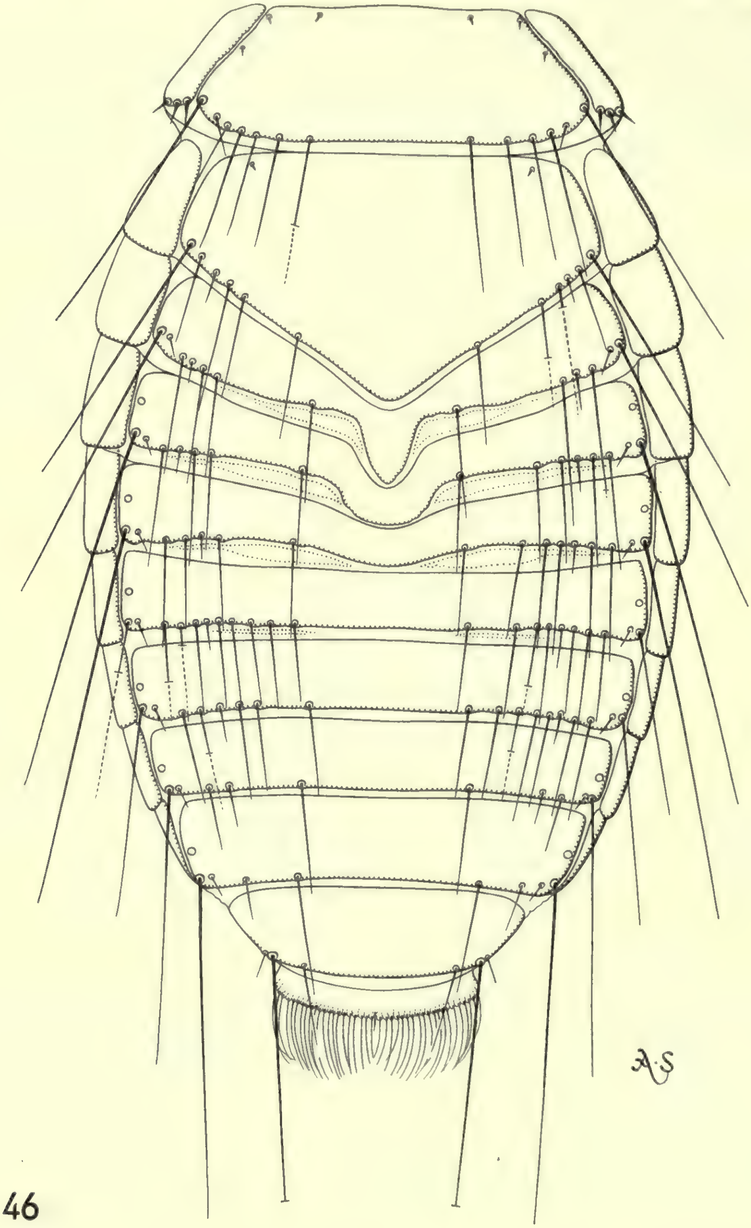


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FIG. 46. *Myrsidea ishizawai*. ♀, dorsal. Lectotype.

### ***Myrsidea ishizawai*** Uchida, 1926

(Pl. II, fig. 1 ; Text-figs. 18, 46, 62, 72)

Type host : *Zoothera dauma* (Latham).

*Myrsidea ishizawai* Uchida, 1926 : 8, fig. 2. Host : *Oreocinchla dauma aurea.*

This is the only species known in this species group and the differences between it and the *thoracica* group have been enumerated above. The following description is

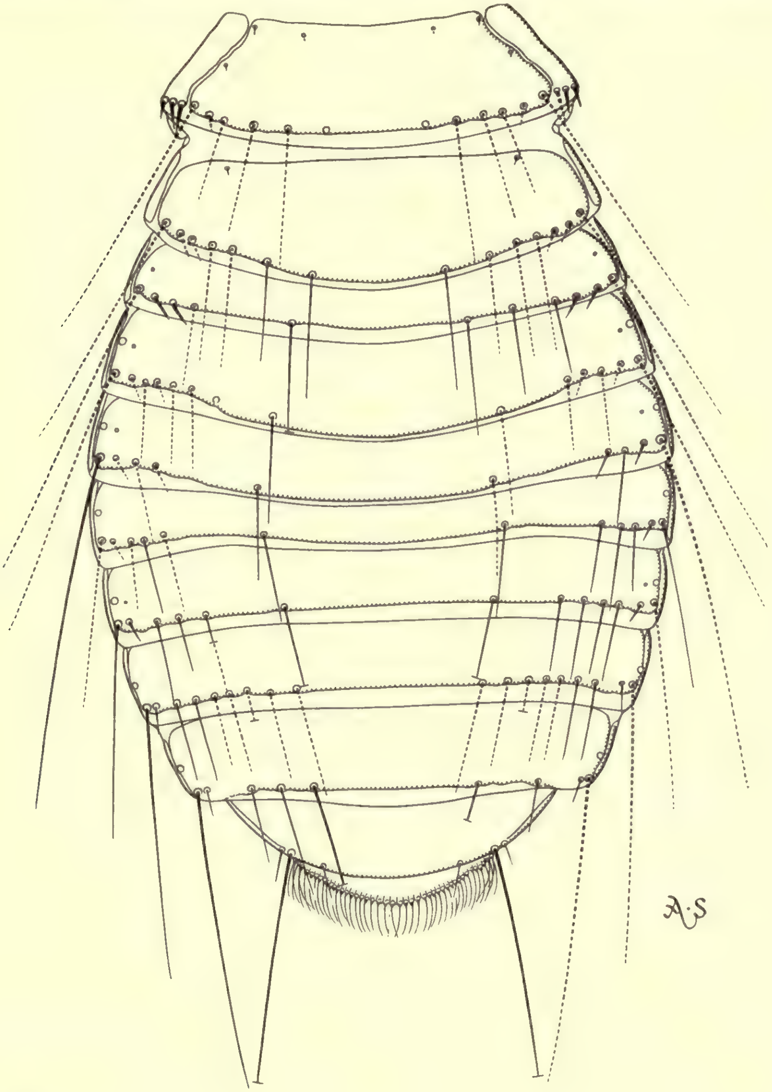

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FIG. 47. *Myrsidea sultanpurensis.* ♀, dorsal. Holotype.

compiled from two males and three females from Japan, including one male and two female syntypes.

♀ and ♂. Setae of latero-ventral head fringe : 13–14 each side ; gular setae : 6 + 6 (2 ♀), 7 + 7 (1 ♀) ; 5+6 (1 ♂), 6 + 6 (1 ♂). Central setae of metanotum : 3 ♀, 5–6 each side ; 2 ♂, 3–5 each side. Outer setae of first tibia ; 3 ♀, 17–21 ; 2 ♂, 16–20. Setae of femoral brush ; 3 ♀, 37–41 ; 2 ♂, 30–32. Female with abdominal sternites not markedly arched and with irregular pigmented patches present between the tergites of segments II–VI. Male genital sclerite of characteristic form (Text-fig. 72) and unlike those of the *thoracica* group.

Abdominal Chaetotaxy. This species differs from all others from the Turdinae in having post-spiracular III long and similar to those of II and IV ; V and VI are long but markedly shorter than IV (Text-fig. 46). Tergocentral setae : 3 ♀, I, 10 ; II, 9–13 ; III, 11–12 ; IV, 12–16 ; V, 15–17 ; VI, 12–15 ; VII, 6–7 ; VIII, 4 ; the two inner posterior setae of IX are long ; 2 ♂, I, 8–9 ; II, 8–11 ; III, 10 ; IV, 10–11 : V, 10–12 : VI, 6–10 ; VII, 4 ; VIII, 4. Marginal setae of sternal brushes separated from central sternal setae ; brushes III–V with numerous setae. Sternal setae : 1 ♀. II, 8 anterior, 22 marginal and 4 + 4 in the aster : III, 18 (12) + 15 + 14 (8) ; IV, 27 (18) + 11 + 27 (19) ; V, 29 (21) + 8 + 24 (17) ; VI, 13 (6) + 7 + 14 (7) ; VII, 3 (1) + 3 + 3 + 2 (0) ; VIII–IX, 6 + 5. The vulval setae of the three females range from 12–15. Range of setae in six brushes (including marginal setae) on each of the following sternites of the three females : III, 14–20 ; IV, 26–35 ; V, 24–33. 2 ♂, II, 6 and 7 anterior, 18 and 16 marginal and 4 + 4 in aster ; III, 16 (10) + 14 + 17 (12) and 12 (6) + 12 + 11 (5) ; IV, 26 (17) + 10 + 24 (15) and 21 (14) + 11 + 23 (15) ; V, 25 (17) + 10 + 27 (19) and 25 (18) + 9 + 22 (15) ; VI, 20 (13) + 9 + 19 (11) and 17 (10) + 8 + 18 (11). VII, 8 (5) + 8 + 6 (3) and 4 (1) + 6 + 2 (1); VIII, 2 (1) + 4 (1) + 4 (1) + 1 and 1 (0) + 4 (1) + 2 + 1 (0). IX, 4 + 4 and 4 + 5.

Material examined. Syntypes : 1 ♂, 2 ♀ from " Toratsugumi " = *Zoothera dauma*. JAPAN : Subashiri, Fuji, 14.v.1924. From the same host, JAPAN : Oyama, 1 ♂, 1 ♀, 23.iv.1956, B.M. (N.H.).

LECTOTYPE of *Myrsidea ishizawai* by present designation : ♀ slide with original label and data as given above.

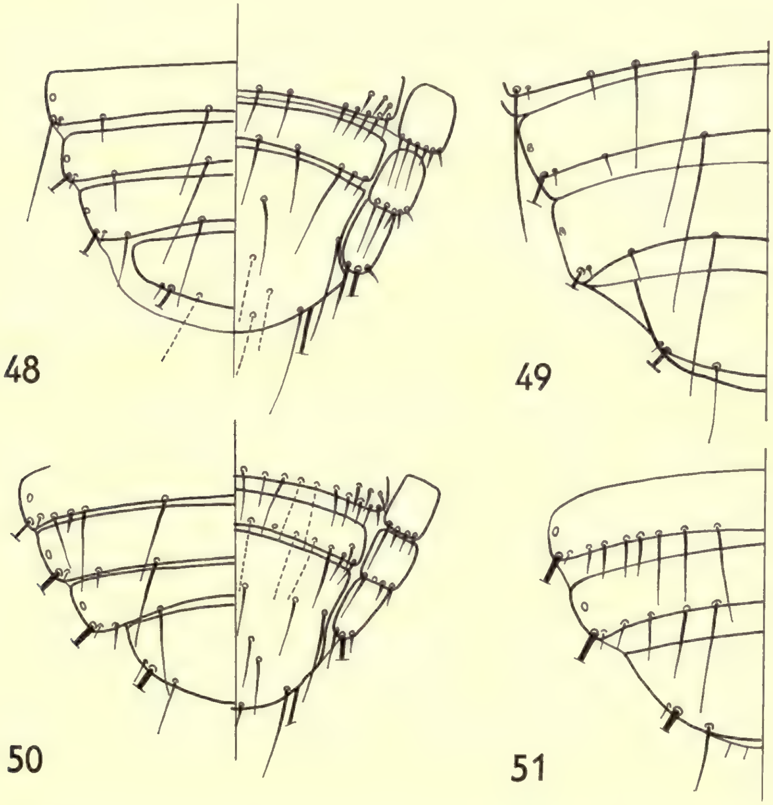
4 ♂, 4 ♀ from *Turdus d. dauma* from Assam agree with the type specimens in the form of the head, female abdominal tergites, male genitalia and number of outer tibial setae ; they differ in the post-spiracular setae being shorter and thinner ; in averaging fewer setae in the femoral brushes and on the abdominal tergites and sternites. For instance, the total numbers of tergocentral setae on segments I–VII in the three females from Japan are : 79, 85 and 86 mean 83 and in four females from Assam the numbers are 65, 67, 72, 76, mean 70 ; in the two males from Japan : 52 and 63, mean 57·5 and from Assam : 41, 51, 61, mean 51. In the female the number of setae in the sternal brushes of IV (including the marginal setae) ranges from 26–35, mean 30 in the Japanese specimens and from 20–27, mean 23·3 in the Assam specimens and on sternite V, 24–33, mean 28·5 in the Japanese specimens and 21–29, mean 27·6 in the Assam specimens. There seem to be no constant differences in size. These differences are based on a small number of specimens and no material has been seen from the other fourteen subspecies of *Zoothera dauma* listed in the *Checklist of Birds of the World*, 1964, some of which may show intermediate characters. It is considered therefore that these specimens from Assam should be included in *Myrsidea ishizawai* Uchida, sens. lat.

Material examined. From *Zoothera d. dauma* (Latham), ASSAM : Kohima, 4 ♂, 4 ♀, 28.i.1952 (*R. Meinertzhagen*, No. 19880) B.M. (N.H.).

*Measurements*

(Specimens from Japan)

| | ♀ | | ♂ | |
|---|---|---|---|---|
| | Length | Breadth | Length | Breadth |
| Head 1 | 0·38 | 0·41–0·43 | 0·36–0·37 | 0·39–0·40 |
| Head 2 | | 0·58–0·61 | | 0·54 |
| Prothorax | . . | 0·38–0·39 | . . | 0·35 |
| Metanotum | . . | 0·53–0·57 | . . | 0·43–0·44 |
| Abdomen | 1·10–1·24 | 0·73–0·80 | 0·81–0·85 | 0·61–0·62 |
| Total | 1·99–2·17 | . . | 1·59–1·64 | . . |



FIGS. 48–51. Terminal segments of male abdomen of *Myrsidea* species. 48. *incerta*, dorsal and ventral. 49. *pricei*, dorsal. 50. *destructor*, dorsal and ventral. 51. *abidae*, dorsal.

## The *SULTANPURESIS* Species Group

1. Number and position of head setae as in the *thoracica* group except for the extra ventral setae on the temples as in *ishizawai* ; seta 10 is usually less than half the length of 11. The outer occipital setae are somewhat longer than in the other groups.
2. Number of gular setae average more than in the *thoracica* group.
3. Hypopharynx reduced (to same degree as in Buckup, 1959 : 261, fig. 15).
4. As in *thoracica* group.
5. Metasternal plate with more setae, some of which are placed posteriorly (Text-fig. 4).
6. As in *thoracica* group.
7. Post-spiracular seta III long.
8. Sternite I with setae.
9. Male internal anal setae 10.

10–11. As in *ishizawai*.

Characters 1, 2, 7 and 10–11 above suggest that the affinities of this species lie with *ishizawai* ; for convenience it is separated on the reduction of the hypopharynx (probably not of phylogenetic value, see Clay, 1962 : 220), the presence of setae on sternite I and the small number of outer dorso-lateral setae on tibia I.

*M. kuluensis* Ansari was based on a male and female taken from a kingfisher. There seems little doubt that the types, although in poor condition and the male genital sclerite distorted, are *sultanpurensis* ; the specimens were collected within two days at the same locality as *sultanpurensis* and possibly came from the same host individual.

*M. mikadokiji* Uchida (1917 : 183) known only from the single male type may belong to this group ; it was taken from *Calophasis mikado*, a game bird, so that its true host is unknown. It differs from the male of *sultanpurensis* in having fewer gular setae (5 + 4) and probably slightly in the characters of the genital sclerite, but this is distorted. It is not possible to place this species without females and further males.

### ***Myrsidea sultanpurensis*** Ansari, 1951

(Pl. II, fig. 2 ; Text-figs. 4, 47, 63)

Type host : *Myiophoneus caeruleus temminckii* Gray.

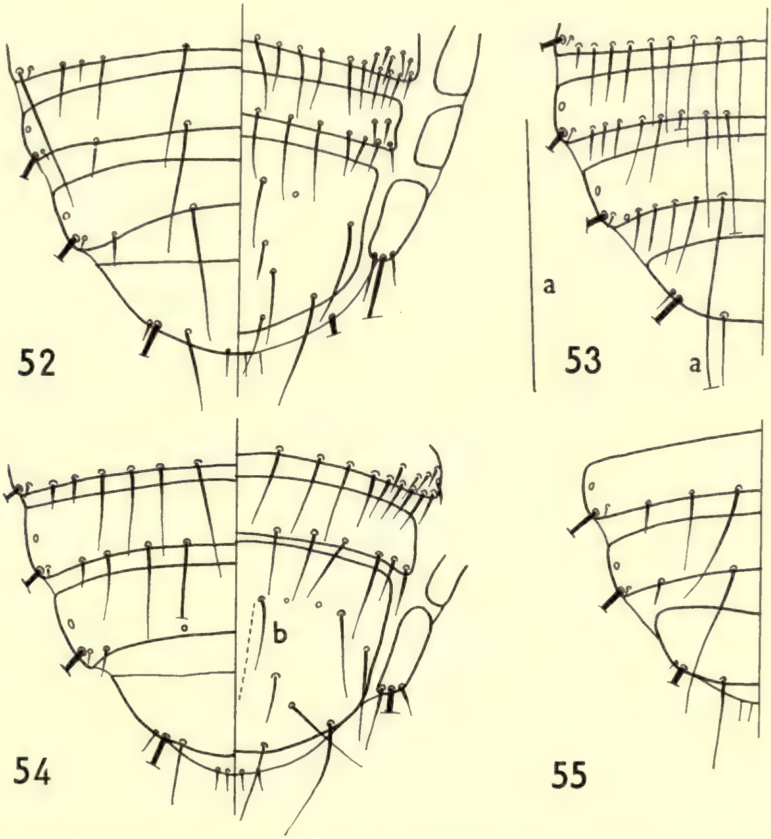
*Myrsidea sultanpurensis* Ansari, 1951 : 183, fig. 22. Host : *Myiophoneus caeruleus temminckii*.
*Myrsidea* (*Alcediniphilus*) *kuluensis* Ansari, 1951 : 190, fig. 25. Host : *Ceryle lugubris guttulata*. [Error] **syn. nov.**

This is the only known species in the species group and it is at once distinguished from all previous species by the reduction of the hypopharynx and the presence of setae on abdominal sternite I. The following description is compiled from the holotype female, two female paratypes and ten males and seven females from the type host.

♀ and ♂. Setae of latero-ventral head fringe : ♀, 10–11 ; ♂, 8–11 ; seta 10 usually less than half length of 11 (range of ratio 10/11 : 0·33–0·50, mean (12) 0·40) ; gular setae : ♀, 11–18, mean (10) 15·7 ; ♂, 16–18, mean (8) 16·7. Central marginal setae of metanotum : ♀, 5–6 each side ; ♂, 4–5. Metasternal setae (Text-fig. 4) : ♀, 5–8 each side : ♂, 5–7. Outer setae of first tibia :

4–5. Setae of femoral brushes show rather a wide range : ♀, 17–28, mean (16) 20·7 ; ♂ 15–22, mean (16) 18·8. Female with abdominal sternites not markedly arched. In all available specimens the male genital sclerite is somewhat distorted but appears to be the same as that of *ishizawai*.

Abdominal Chaetotaxy. Post-spiracular seta III, although not so long as that of *ishizawai*, is longer than in the *thoracica* group ; V and VI are similar in length to those of *ishizawai*. Tergocentral setae : 3 ♀, I, 9–12 ; II, 7–11 ; III, 8–10 ; IV, 6–7 ; V, 5–8 ; VI, 6–10 ; VII, 7–14 ; VIII, 4–6 ; the two inner posterior setae of IX are short. 4 ♂, I, 6–8 ; II, 7–9 ; III, 8–10 ; IV, 8–10 ; V, 4–10 ; VI, 7–8 ; VII, 5–11 ; VIII, 4 ; lengths of posterior tergal setae as in *ishizawai*, except that the two inner posterior setae on IX are shorter, varying from a third to a half of those of *ishizawai*. Sternal setae : 3 ♀, I, 2–4, mean 3·1 ; setae of aster 5–6, mean (18 asters) 5·5 ; II, 13–15 anterior, 16–17 marginal ; III, anterior lateral 1–5, marginal plus those of brushes 23–27 ; IV, anterior 6–15, marginal 25–30 ; V, 7–14, 25–32 ; VI, 6–11, 24–28 ; VII, 0–3, 11–12 ; VIII–IX, 15–17 ; vulval setae : 13–21, one to five of the outer vulval setae may be stout and spine-like. Sternite I : 10 ♂, 2–5, mean 3·7 ; setae in aster : 4–6, mean 4·75. Sternal setae : 1 ♂, I, 4 ; II, 11 anterior, 15 marginal and 4 + 5 in aster ; III, 5 (0) + 14 + 6 (2) ;



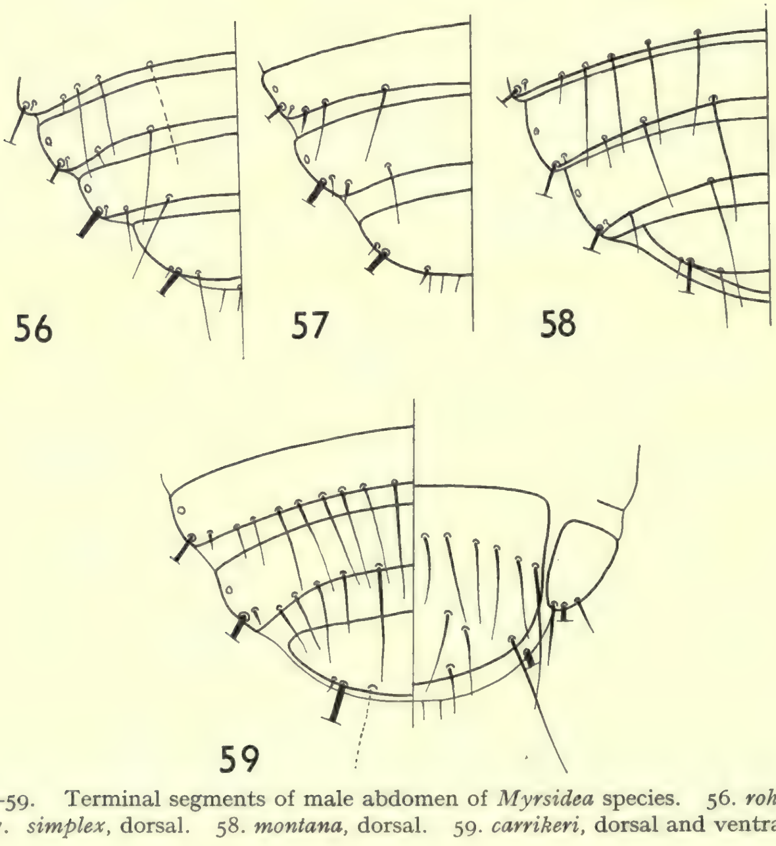
FIGS. 52–55. Terminal segments of male abdomen of *Myrsidea* species. 52. *devastator*, dorsal and ventral. 53. *regius*, dorsal. a, length of central tergocentral seta of VIII. 54. *indigenella*, dorsal and ventral. b, dotted line is length of this seta on other side of body. 55. *varia*, dorsal.

IV, 14 (7) + 10 + 14 (7); V, 14 (7) + 10 + 13 (6); VI, 11 (6) + 11 + 11 (6); VII, 4 (1) + 6 + 4 (2); VIII, 3 + 3; IX, 2 + 3 (other specimens range from 3–6 each side); internal anal setae 10, terminal setae 3.

Material examined. Holotype female and two paratype females from *Myiophoneus caeruleus temminckii*, PAKISTAN, Panjab, Kulu, 6.x.1939, B.M. (N.H.). From the same host, 10 ♂, 7 ♀, AFGHANISTAN, iv.1937 (*R. Meinhertzhagen*, nos. 9491, 9749), B.M. (N.H.). Holotype female and allotype male of *M. kuluensis* from *Ceryle lugubris guttulata*, PAKISTAN, Panjab, Kulu, 6.x.1939, B.M. (N.H.).

*Measurements*

| | ♀ | | | | ♂ | | | |
|---|---|---|---|---|---|---|---|---|
| | Length | Breadth | Range (8) | Mean | Length | Breadth | Range (8) | Mean |
| Head 1 | 0·36 | 0·43 | 0·40–0·43 | 0·42 | 0·33 | 0·39 | 0·37–0·40 | 0·38 |
| Head 2 | | 0·62 | 0·58–0·62 | 0·60 | | 0·55 | 0·53–0·59 | 0·55 |
| Prothorax | .. | 0·36 | .. | .. | .. | 0·32 | .. | .. |
| Metanotum | .. | 0·51 | .. | .. | .. | 0·39 | .. | .. |
| Abdomen | 1·02 | 0·79 | .. | .. | 0·92 | 0·57 | .. | .. |
| Total | 1·82 | .. | .. | .. | 1·64 | .. | .. | .. |



FIGS. 56–59. Terminal segments of male abdomen of *Myrsidea* species. 56. *rohi*, dorsal. 57. *simplex*, dorsal. 58. *montana*, dorsal. 59. *carrikeri*, dorsal and ventral.

### ***Myrsidea iliaci*** Eichler, 1951

Type host: *Turdus iliacus* Linn.

*Myrsidea iliaci* Eichler, 1951. *Zool. Anz.*, **146** : 52. Host : *Turdus musicus.*

This species is quite unrecognizable from the description and there is no figure. Dr. Eichler informs me that the type is lost and as no specimens from the type host have been seen nothing further can be said about this name.

## HOST LIST

Turdinae arranged according to Mayr and Paynter, 1964

*Type host.

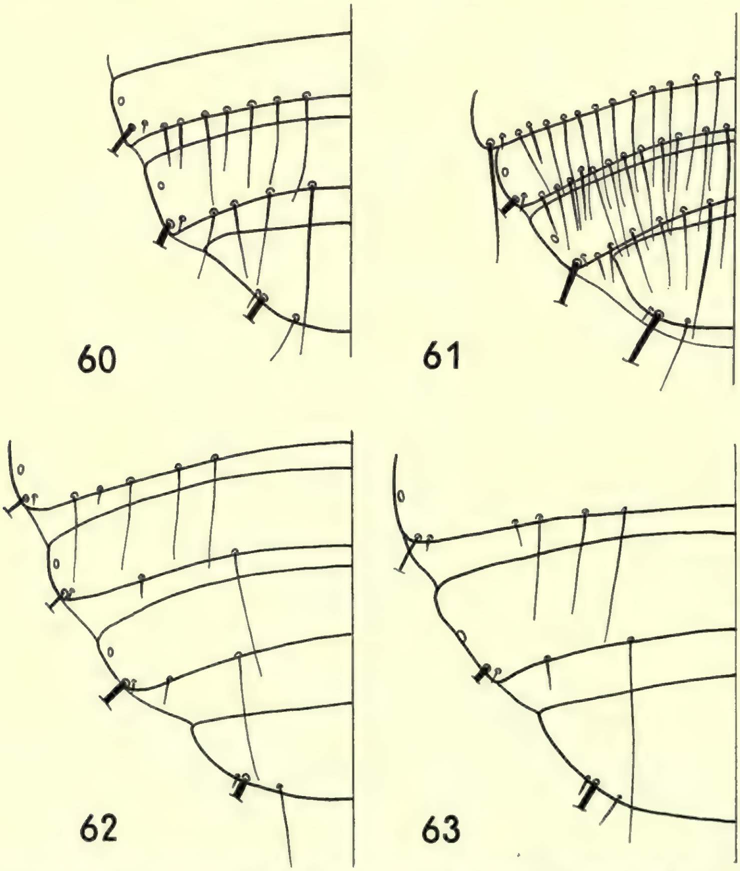
| HOST | *Myrsidea* SPECIES | *Page No.* |
|---|---|---|
| **Myiophoneus caeruleus temminckii* | *M. sultanpurensis* Ansari | 382 |
| **Zoothera gurneyi otomitra* | *M. montana* sp. n. | 367 |
| **Zoothera dauma* | *M. ishizawai* Uchida, 1926 | 379 |
| **Catharus g. gracilirostris* | *M. rohi* Ansari, 1956 | 364 |
| **Catharus fuscater mentalis* | *M. simplex* Ansari, 1956 | 366 |
| **Catharus m. mexicanus* | *M. destructor* Ansari, 1956 | 353 |
| *Catharus minimus bicknelli*<br>**Catharus u. ustulatus* | *M. incerta* (Kellog, 1896) | 349 |
| **Catharus guttatus* | *M. pricei* sp. n. | 351 |
| **Turdus a. abyssinicus* | *M. keniensis* sp. n. | 348 |
| *Turdus bouloul*<br>*Turdus merula*<br>*Turdus chrysolaus*<br>*Turdus obscurus*<br>*Turdus ruficollis*<br>**Turdus viscivorus* | *M. thoracica* (Giebel, 1874) | 342 |
| **Turdus iliacus* | *M. iliaci* Eichler, 1951 | 385 |
| **Turdus serranus* | *M. devastator* Ansari, 1956 | 354 |
| *Turdus maranonicus* | *M. indigenella* Ansari, 1956 | 356 |
| **Turdus rufiventris* | *M. elegans* Ansari, 1956 | 376 |
| **Turdus ignobilis* | *M. varia* Ansari, 1956 | 362 |
| **Turdus fumigatus aquilonalis* | *M. abidae* Ansari, 1956 | 358 |
| **Turdus fumigatus obsoletus* | *M. regius* Ansari, 1956 | 360 |
| **Turdus grayi casius* | *M. carrikeri* (Eichler, 1943) | 370 |
| **Turdus g. grayi* | *M. antiqua* Ansari, 1956 | 372 |
| **Turdus nudigenis* | *M. aitkeni* sp. n. | 374 |
| **Turdus migratorius* | *M. emersoni* sp. n. | 346 |

## NOTES

### 1. TYPES OF SPECIES DESCRIBED BY ANSARI, 1956.

The collection of types was sent to me by the U.S. National Museum in the condition it was received from Dr. Ansari. On receipt each slide was marked on the back with the label " U.S. Mus. Wash. " ; all these slides and any new slides with remounts from the original material have been marked on the back " Specimens seen by Ansari ". This was necessary as further material from the same host individuals is present in the Carriker collection.

The slides had no specific names on them and apart from two, no holotype, allotype or paratype designations, although these were designated in the original descriptions. Certain slides had a pencil tick and it has been presumed that this indicates the slide with the holotype and allotype specimens. The specimens could only be identified by comparing the host names and localities on the slide labels with those given in the original descriptions. The male on the slide with the pencil tick, from the type host of the species, has been labelled as holotype (all the holotypes designated were males) and the female as allotype. In those cases where there is more than one male on the slide with the pencil tick, one of these has been designated as lectotype ; where there are two females these are both considered to be paratypes and the allotype designation ignored. Although in the original description measurements of the holotypes are given, it was not found possible to relate these measurements to any particular specimen and therefore holotypes could not be recognized in that way. Female allotypes were designated but no mention made of the distinctive characters of the abdominal terga.



FIGS. 60–63. Terminal segments of male abdomen of *Myrsidea* species, dorsal. 60. *antiqua*. 61. *elegans*. 62. *ishizawai*. 63. *sultanpurensis*.

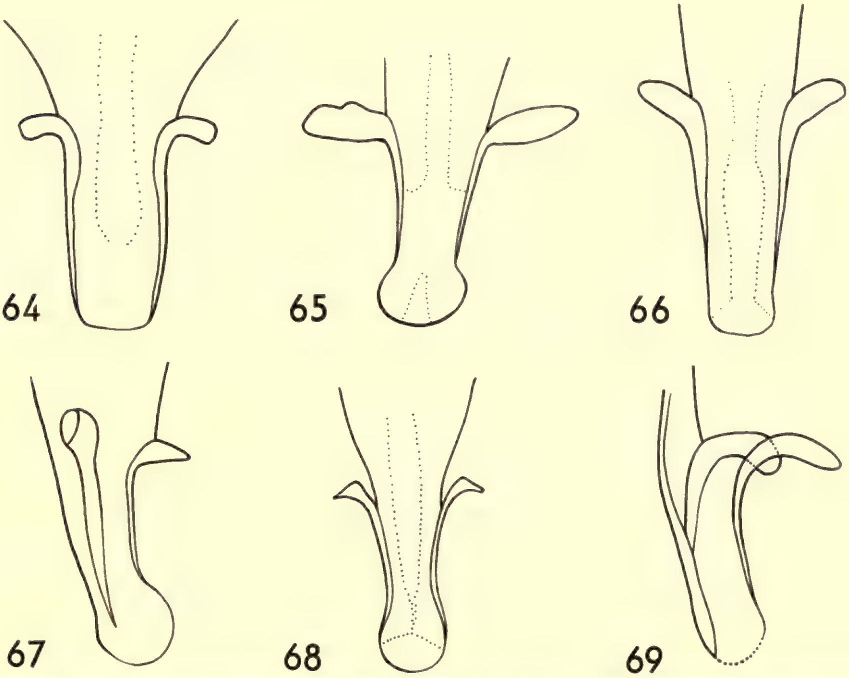
In some specimens it was impossible to see the characters necessary for identification and these have been remounted. When additional slides have been used for this, they are labelled with photocopies of the original labels and a note has been made on the slide saying that the specimens have been remounted from the original type slide and the number of that slide given. All these species were published as new twice (1956 : 163–177 and 1956 : 61–62) ; in the second publication only a key to the species and the type hosts are given. As it has not been possible to find out the exact date of publication of either of these journals, only the first reference has been used ; this paper includes details of the type hosts, making it possible to identify the specimens, which it is not possible to do from the descriptions.

### 2. ***Myrsidea fuscomarginata*** (Osborn, 1896)

Type host : Unknown.

*Menopon fuscomarginatum* Osborn, 1896. *Bull. U.S. Bur. Ent.* (*n.s.*), **5** : 245. Host : *Turdus minor* [Error].

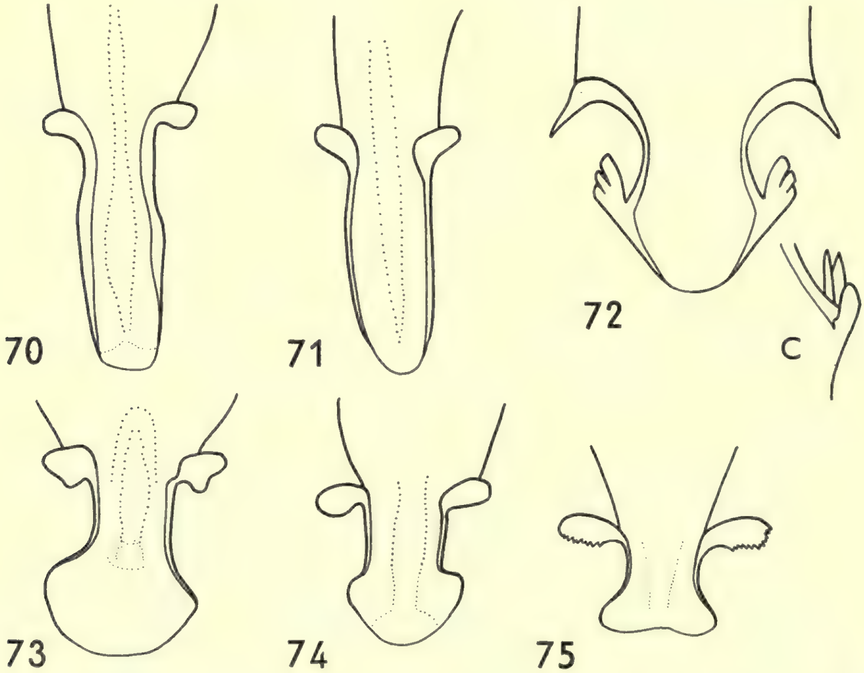
Through the kindness of Dr. P. J. Darlington of the Museum of Comparative Zoology, Harvard University, it has been possible to examine the type specimens of this species. These are similar to authenticated material from species of Icteridae and are presumably stragglers from one of these birds. The species will be dealt with more fully in a subsequent part.



Figs. 64–69. Male genital sclerites of *Myrsidea* species. 64. *thoracica*. 65. *emersoni*. 66. *incerta*. 67. *destructor*, distorted. 68. *devastator*. 69. *indigenella*, distorted.

## 3. Genera Described by Zlotorzycka, 1964

It is difficult to understand some of these genera, as the characters used for separation may be incorrect or found in other species or variable within the group. For instance, a female paratype of *Eichlerinopon celeripes* = *M. cornicis* has a group of spine-like setae at each postero-lateral corner of sternite II although these are said to be absent (: 179), these are also present in *M. anthorax*. *M. anaspila* also placed in this " genus " has a long group of setae each end of sternite II. The two latter species do not have the modifications of the anterior tergites as described. The males of these three species all have a group of spine-like or elongated setae each side of sternite II not as given in the description. Further, as the males and females of *E. celeripes*, the type-species, belong to different species (see below) it is difficult to know what this " genus " represents. One of the characters separating *Densidea* is said to be that the spine-like setae in the aster of sternite II are all long in the female and in the male some are shorter. However, it can be seen in the measurements of these setae (see below) from a small number of males and females of *rustica* (the type-species of *Densidea*) that there is overlap in the lengths in the two sexes so that this is not even a specific character



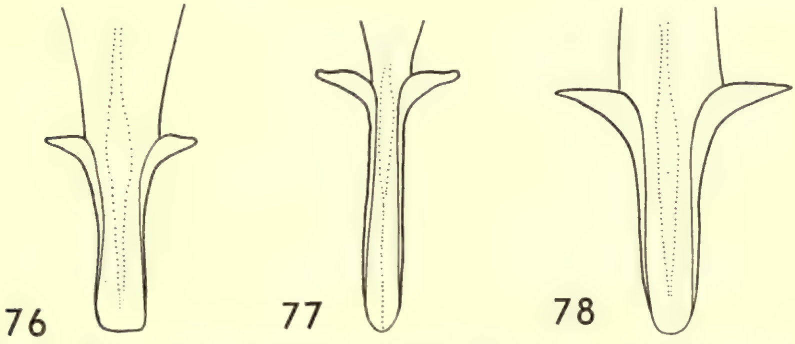
Figs. 70–75. Male genital sclerites of *Myrsidea* species. 70. *abidae*. 71. *regius*. 72. *ishizawai*. C, lateral comb-like structure, distorted. 73. *varia*. 74. *rohi*. 75. *simplex*.

| | ♀ | ♂ |
|---|---|---|
| 1st (outer) spine . . . | 0·028–0·040 (7) | 0·020–0·040 (6) |
| 2nd . . . . . . | 0·038–0·060 (7) | 0·032–0·052 (7) |
| 3rd . . . . . . | 0·048–0·064 (7) | 0·048–0·064 (7) |
| 4th . . . . . . | 0·054–0·068 (6) | 0·052–0·070 (7) |
| 5th (not always present) . | 0·060–0·072 (4) | 0·056–0·078 (4) |

Confusion has also been caused by some of the specimens on which descriptions are based being obvious stragglers. For instance, figs. 5a–c said to represent species from *Corvus corax*, *C. frugilegus* and *C.corone* are almost certainly all *Myrsidea cornicis* from *Corvus corone*. The male holotype and the female paratype (photo 9) of *Eichlerinopon celeripes* belong to different species: the female has the hypopharynx reduced and this together with fig. 5b shows that the specimen is *cornicis*, this species is the only one from European *Corvus* in which the hypopharynx is reduced; photo 9 of the male shows the hypopharynx in its normal unmodified form. The male may belong to one of the already described species from the Corvidae but is not recognizable from the description; this is unfortunate as it is the holotype of the type species of *Eichlerinopon*. Paratypes of *Neomyrsidella usitata* Zlotorzycka are typical *Myrsidea anathorax* (Nitzsch) from the same host. It is unfortunate in the descriptions that no figures are given of the female anterior terga (except for one species) nor of the male genital sclerite.

## ACKNOWLEDGEMENTS

I am greatly indebted to various persons and institutions for the loan of type and other material: to Dr. P. D. Hurd and Mr. Jerry A. Powell for assistance in examining some of the Kellogg types; to Dr. J. F. Gates Clarke for the loan of material from the United States National Museum; to Dr. T. H. G. Aitken, Mr. M. A. Carriker, Dr. K. C. Emerson, Professor G. J. Spencer and Dr. J. Zlotorzycka for the loan of specimens. The following abbreviations are used for the collections: B.M. (N.H.)—British Museum (Natural History); C.C.—Carriker collection; E.C.—Emerson collection. I am indebted to Arthur Smith (A.S.) for his figures.



FIGS. 76–78. Male genital sclerites of *Myrsidea* species. 76. *carrikeri*. 77. *antiqua*. 78. *elegans*.

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## TABLES I–VIII

Key to species of *Myrsidea* :

A. *thoracica.*
B. *emersoni.*
C. *keniensis.*
D. *incerta.*
E. *pricei.*
F. *destructor.*
G. *devastator.*
H. *indigenella.*
I. *abidae.*
J. *regius*
K. *varia.*
L. *rohi*
M. *simplex*
N. *montana.*
O. *carrikeri.*
P. *antiqua.*
Q. *elegans.*
R. *ishizawai.*
S. *sultanpurensis.*

R. range ; M. mean ; number of specimens in brackets.

## TABLE I

### *Tergocentral setae*

♀

| | | A. (5) | C. (2) | D. (9) | E. (5) | G. (7) | O. (5) | P. (3) |
|---|---|---|---|---|---|---|---|---|
| I. . | R. | 9–11 | 13–16 | 9–12 | 9–13 | 35–40 | 16–18 | 12–14 |
| | M. | 10·0 | . . | 10·7 | 10·4 | 36·7 | 17·0 | 13·0 |
| II. . | R. | 9–11 | 9–11 | 9–14 | 10–13 | 24–33 | 16–18 | 14–16 |
| | M. | 9·5 | . . | 11·6 | 12·2 | 30·7 | 16·8 | 14·7 |
| III. . | R. | 10–12 | 11–12 | 9–13 | 11–13 | 23–27 | 19–24 | 15–19 |
| | M. | 11·0 | . . | 10·7 | 12·0 | 24·3 | 21·6 | 16·7 |
| IV. . | R. | 11–15 | 11–13 | 8–11 | 10–13 | 20–27 | 21–25 | 14–19 |
| | M. | 12·4 | . . | 9·8 | 11·6 | 23·1 | 23·2 | 17·0 |
| V. . | R. | 13–15 | 12–15 | 7–11 | 8–11 | 14–25 | 22–27 | 16–20 |
| | M. | 13·6 | . . | 9·4 | 9·0 | 21·6 | 25·0 | 18·0 |
| VI. . | R. | 11–13 | 11–14 | 4–6 | 4–6 | 14–24 | 19–25 | 16–22 |
| | M. | 12·0 | . . | 5·2 | 5·3 | 15·7 | 23·0 | 18·3 |
| VII. . | R. | 7–11 | 7 | 4 | 4 | 4–8 | 15–20 | 13–17 |
| | M. | 9·0 | . . | . . | . . | . . | 18·4 | 15·7 |
| VIII. . | R. | 3–4 | 4 | 4 | 4 | 4–6 | 10–12 | 8–11 |
| | M. | 3·8 | . . | . . | . . | . . | 11·0 | 9·3 |

## TABLE II

### *Tergocentral setae*

♂

| | | A. (7) | C. (2) | E. (4) | L. (3) | N. (8) | O. (6) | P. (4) |
|---|---|---|---|---|---|---|---|---|
| I. . | R. | 6–8 | 10–11 | 4–8 | 7–10 | 10–14 | 12–15 | 12–15 |
| | M. | 7·3 | . . | 6·0 | 8·3 | 12·0 | 13·6 | 13·2 |
| II. . | R. | 7–10 | 10–11 | 8–11 | 7–10 | 10–13 | 14–18 | 15–17 |
| | M. | 8·7 | . . | 9·5 | 8·5 | 11·0 | 16·0 | 15·7 |
| III. . | R. | 8–11 | 10–12 | 8–11 | 9–10 | 10–14 | 17–22 | 15–17 |
| | M. | 9·9 | . . | 9·7 | 9·3 | 12·0 | 19·5 | 16·2 |
| IV. . | R. | 9–12 | 11–13 | 10–13 | 9–10 | 10–13 | 19–22 | 17–20 |
| | M. | 10·9 | . . | 11·0 | 9·5 | 11·6 | 21·0 | 17·7 |
| V. . | R. | 7–14 | 12–13 | 9–10 | 7–9 | 11–14 | 19–24 | 16–19 |
| | M. | 11·0 | . . | 9·6 | 8·0 | 12·0 | 21·3 | 16·7 |
| VI. . | R. | 9–11 | 11–12 | 4–8 | 7–8 | 8–14 | 18–21 | 15–17 |
| | M. | 10·0 | . . | 6·0 | 7·7 | 11·0 | 20·0 | 15·5 |
| VII. . | R. | 6–9 | 8·9 | 4 | 4 | 6·8 | 15–18 | 13–15 |
| | M. | 7·3 | . . | 4·0 | 4·0 | 7·0 | 17·0 | 14·0 |
| VIII. . | R. | 4 | 3–5 | 4 | 4 | 4–7 | 9–12 | 7–9 |
| | M. | 4·0 | . . | 4·0 | 4·0 | 5·4 | 10·0 | 8·0 |

## TABLE III

*Marginal setae of sternites**

| | | A. (5) | D. (14) | I. (2) | J. (5)+ | L. (2) | M. (3) | O. (2) | P. (3) |
|---|---|---|---|---|---|---|---|---|---|
| III. . | R. | 22–25 | 17–18 | 24–25 | 21–22 | 16–18 | 13–15 | 26 | 21–23 |
| | M. | 23·6 | .. | .. | 21·7 | .. | 14·0 | .. | 21·6 |
| IV. . | R. | 24–26 | 16–22 | 23–24 | 22–24 | 17–18 | 18–20 | 26–28 | 20–25 |
| | M. | 25·2 | .. | .. | 23·0 | .. | 19·0 | .. | 22·0 |
| V. . | R. | 21–24 | 19–21 | 22–23 | 23–24 | 17 | 16–19 | 24–28 | 21–22 |
| | M. | 23·0 | .. | .. | 23·4 | .. | 17·6 | .. | 21·6 |
| VI. . | R. | 20–23 | 17–22 | 20–22 | 19–22 | 18 | 16–17 | 23–26 | 20 |
| | M. | 21·4 | .. | .. | 20·8 | .. | 16·6 | .. | .. |
| VII. . | R. | 12–14 | 8–14 | 10–11 | 14–17 | 15–17 | 8–10 | 15 | 10–11 |
| | M. | 13·2 | .. | .. | 15·2 | .. | 9·0 | .. | 10·3 |
| VIII. . –IX | R. | 10–12 | 8–12 | 11 | 11–17 | 11 | 11–12 | 12–17 ● | 13–15 |
| | M. | 10·8 | .. | .. | 14·6 | .. | 11·3 | .. | 13·6 |
| Vu. | R. | 11–13 | 10–13 | 13–15 | 17–22 | 11–14 | 12–15 | 12–16 ● | 13–15 |
| | M. | 12·0 | .. | .. | 19·0 | .. | 13·3 | 13·6 | 14·0 |

* Includes marginal setae of brushes ; + includes Trinidad specimens ; ● range and mean of 5 specimens ; Vu. marginal setae of vulva.

## TABLE IV

*Lateral anterior sternal setae**

♀

| | | A. (10) | D. (28) | I. (4) | J. (10) | L. (4) | M. (6) | O. (4) | P. (6) |
|---|---|---|---|---|---|---|---|---|---|
| III. . | R. | 0–2 | 0–2 | 2–3 | 4–7 | 0–3 | 0 | 2 | 2–3 |
| | M. | 0·7 | .. | .. | 4·9 | 1·5 | 0 | 2·0 | 2·7 |
| IV. . | R. | 6–9 | 2–6 | 10–11 | 7–11 | 2–3 | 3–5 | 5–7 | 6–9 |
| | M. | 7·8 | .. | .. | 8·9 | 2·5 | 3·8 | 6·0 | 7·8 |
| V. . | R. | 8–13 | 4–8 | 8–10 | 7–11 | 2–5 | 3–5 | 9–10 | 6–8 |
| | M. | 10·2 | .. | .. | 9·1 | 3·7 | 4·2 | 9·2 | 7·2 |
| VI. . | R. | 4–9 | 2–6 | 5–7 | 4–10 | 0–2 | 2–5 | 4–5 | 4–6 |
| | M. | 6·6 | .. | .. | 7·3 | 1·0 | 2·7 | 4·8 | 5·3 |
| VII. . | R. | 0–3 | 0–1 | 1–2 | 0–3 | 0 | 0–1 | 1 | 0–1 |
| | M. | 1·1 | .. | .. | 1·1 | 0 | 0·17 | 1·0 | 0·83 |

* Lateral brushes, not including marginal setae, each side of abdomen considered separately.

## TABLE V

*Marginal setae of sternites*

♂

| | | A. (7) | I. (2) | J. (3)* | K. (3) | L. (3) | N. (8) | O. (2) | P. (4) | Q. (3) |
|---|---|---|---|---|---|---|---|---|---|---|
| III. . | R. | 16–24 | 23–24 | 20–23 | 19–21 | 12–15 | 17–23 | 24–25 | 22–28 | 28–29 |
| | M. | 19·7 | .. | .. | .. | .. | 19·6 | .. | 24·5 | .. |
| IV. . | R. | 20–23 | 24–25 | 22–25 | 18–20 | 14–15 | 21–24 | 22–32 | 22–24 | 27–28 |
| | M. | 21·3 | .. | .. | .. | .. | 22·0 | .. | 23·0 | .. |
| V. . | R. | 18–23 | 24 | 21–24 | 19–20 | 15–17 | 18–22 | 25 | 22–26 | 27–28 |
| | M. | 20·7 | .. | .. | .. | .. | 20·7 | .. | 23·7 | .. |
| VI. . | R. | 17–22 | 19–22 | 19–22 | 17–18 | 15–16 | 17–22 | 23 | 20–24 | 22–26 |
| | M. | 19·6 | .. | .. | .. | .. | 19·1 | .. | 22·0 | .. |
| VII. . | R. | 12–15 | 12–17 | 14–17 | 12–13 | 14–15 | 10–15 | 17–18 | 14 | 18–27 |
| | M. | 13·3 | .. | .. | .. | .. | 13·4 | .. | .. | .. |
| VIII. . | R. | 5–8 | 7–8 | 8–10 | 5–6 | 4–7 | 5–12 | 11–14+ | 9–11 | 13–16 |
| | M. | 6·4 | .. | .. | .. | .. | 7·6 | 12·0 | 10·7 | .. |
| IX. . | R. | 6–8 | 10–12 | 8–11 | 8–9 | 8–9 | 6–9 | 8–11+ | 8–10 | 12–10 |
| | M. | 7·1 | .. | .. | .. | .. | 7·9 | 9·0 | 9·0 | .. |

* Includes one Trinidad specimen, see also text. + 6 specimens.

## TABLE VI

*Lateral anterior sternal setae*

♂

| | | A. (14) | I. (4) | J. (6)* | K. (6) | L. (6) | N.(16) | O. (4) | P. (8) | Q. (5) |
|---|---|---|---|---|---|---|---|---|---|---|
| III. . | R. | 0–2 | 1–2 | 3–5 | 0–2 | 0–1 | 2–5 | 2–3 | 1–3 | 1–4 |
| | M. | 0·71 | .. | 4·0 | .. | .. | 3·1 | .. | 1·7 | .. |
| IV. . | R. | 3–7 | 6–9 | 7–10 | 4–5 | 1–4 | 3–8 | 5–9 | 4–8 | 5–8 |
| | M. | 4·8 | .. | 8·0 | .. | .. | 5·8 | .. | 5·9 | .. |
| V. . | R. | 4–8 | 4–7 | 7–10 | 4–6 | 2–3 | 4–8 | 6–7 | 4–9 | 6–9 |
| | M. | 6·5 | .. | 8·5 | .. | .. | 6·1 | .. | 7·1 | .. |
| VI. . | R. | 2–5 | 4–8 | 6–7 | 3–4 | 1–3 | 2–6 | 5–7 | 6–9 | 3–8 |
| | M. | 4·1 | .. | 6·5 | .. | .. | 4·6 | .. | 6·7 | .. |
| VII. . | R. | 0–1 | 1–2 | 1–2 | 0–1 | 0 | 0–3 | 1 | 1–2 | 0–6 |
| | M. | 0·5 | .. | 1·5 | .. | .. | 0·4 | .. | 1·1 | .. |

* As in Table V.

## TABLE VII

*Lengths of setae of pleurite VIII*

♀

| | | A. | B. | C | D. | E. | F. | G. |
|---|---|---|---|---|---|---|---|---|
| I. | R. | 0·092–0·206 | 0·100–0·184 | 0·056–0·066 | 0·052–0·072* | 0·072–0·110+ | 0·048–0·056 | 0·056–0·078 |
| | M. | 0·132 (7) | 0·135 (6) | (4) | (6) | 0·092 (7) | (2) | .. |
| O. | R. | 0·052–0·064 | 0·058–0·106 | 0·052–0·064 | 0·024–0·036* | 0·044–0·056 | 0·034 | 0·050–0·056 |
| | M. | 0·059 (7) | 0·072 (7) | (4) | (6) | 0·048 (11) | (1) | .. |

*Also one I = 0·040 & one O = 0·058. + Also one specimen with I = 0·052 + 0·056.

| | | H. | I. | J. | K. | L. | M. | N. |
|---|---|---|---|---|---|---|---|---|
| I. | R. | 0·096 | 0·056–0·064 | 0·054–0·092 | 0·052 | 0·060–0·080 | 0·040–0·060 | 0·070–0·088 |
| | M. | (1) | (4) | (4) | (1) | (3) | 0·048 (6) | (4) |
| O. | R. | 0·060 | 0·058–0·060 | 0·052–0·072 | 0·048 | 0·024–0·032 | 0·036–0·048 | 0·060–0·068 |
| | M. | (1) | (2) | (4) | (1) | (3) | 0·043 (6) | (2) |

| | | O. | P. | Q. | R. | S. |
|---|---|---|---|---|---|---|
| I. | R. | 0·080–0·112 | 0·072–0·104 | 0·132–0·140 | 0·180–0·260 | 0·056–0·080 |
| | M. | 0·095 (8) | 0·090 (6) | (2) | (5) | 0·067 (7) |
| O. | R. | 0·046–0·068 | 0·042–0·052 | 0·044–0·060 | 0·036–0·056 | 0·040–0·064 |
| | M. | 0·059 (7) | 0·048 (6) | (2) | (5) | 0·050 (7) |

## TABLE VIII

*Lengths of setae of pleurite VIII*

♂

| | | A. | B. | C. | D. | E. | F. | G. |
|---|---|---|---|---|---|---|---|---|
| I. | R. | 0·088–0·130 | 0·072–0·086 | 0·066–0·092 | 0·052–0·064 | 0·076–0·096 | 0·036–0·048 | 0·052–0·068 |
| | M. | 0·103 (8) | (6) | (3) | (4) | 0·085 (7) | (2) | (4) |
| O. | R. | 0·034–0·040 | 0·022–0·034 | 0·032–0·044 | 0·020–0·028 | 0·022–0·034 | 0·036 | 0·030–0·036 |
| | M. | 0·038 (11) | (6) | (6) | (4) | 0·029 (9) | (1) | (4) |

| | | H. | I. | J. | K. | L. | M. |
|---|---|---|---|---|---|---|---|
| | | (2) | (4) | (4) | (4) | (3) | (2) |
| I. | R. | 0·080–0·084 | 0·048–0·070 | 0·072–0·088 | 0·068–0·080 | 0·040–0·076 | 0·040–0·044 |
| O. | R. | 0·040–0·044 | 0·040–0·048 | 0·032–0·034 | 0·028–0·036 | 0·016–0·020 | 0·028–0·026 |

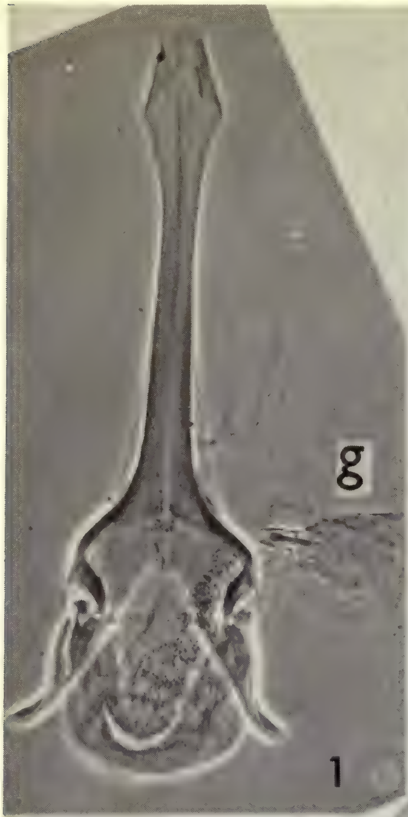
| | | N. | O. | P. | Q. | R. | S. |
|---|---|---|---|---|---|---|---|
| I. | R. | 0·068–0·090 | 0·076–0·112 | 0·076–0·100 | 0·096–0·114 | 0·216 | 0·044–0·060 |
| | M. | 0·073 (6) | 0·102 (10) | 0·084 (7) | (2) | (1) | 0·054 (6) |
| O. | R. | 0·028–0·042 | 0·028–0·040 | 0·032–0·036 | 0·028–0·036 | 0·036–0·044 | 0·028–0·033 |
| | M. | 0·033 (5) | 0·037 (8) | 0·034 (7) | (2) | (4) | 0·030 (6) |

### EXPLANATION OF TABLES VII & VIII

R. = range in mm.; M = mean and/or number of setae; I. = seta on inner side and O. on outer side of long stout central seta; where there are four pleural setae the longest inner or outer is given.

## PLATE 1

FIGS. 1–7. *Myrsidea* spp. 1, *thoracica* (Giebel). Male genitalia. g, genital sclerite ; 2, *latifrons* (Carriker). Male genital sclerite ; 3, *picae* (Linn.). Male genital sclerite ; 4, *antiqua* Ansari. Spermatheca ; 5, *thoracica* (Giebel). Sclerotized end of spermathecal tube ; 6, *thoracica* (Giebel). Metasternal plate and view of flattened mesothorax ; b, mesonotum ; c, mesosternum, d, metasternal plate ; 7, *montana* sp. n. Male genital sclerite. All phase contrast.



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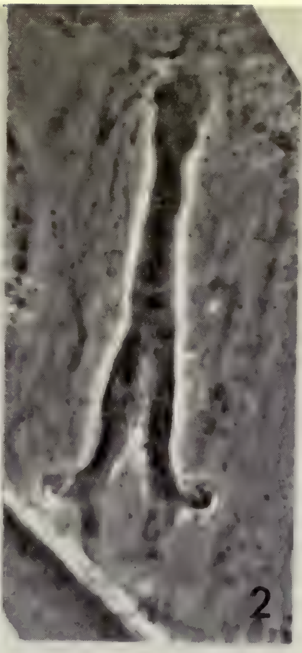
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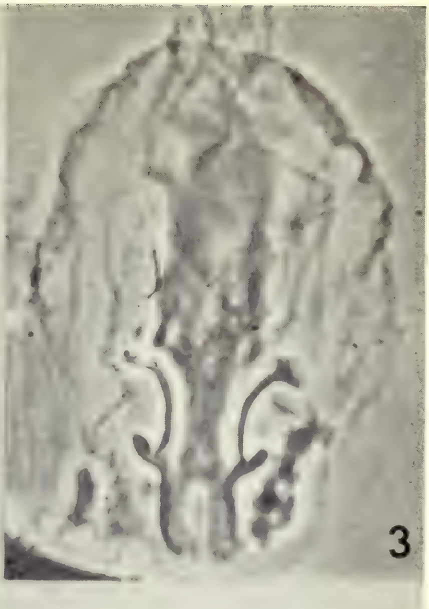
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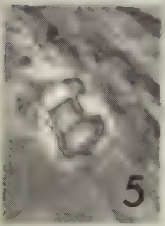
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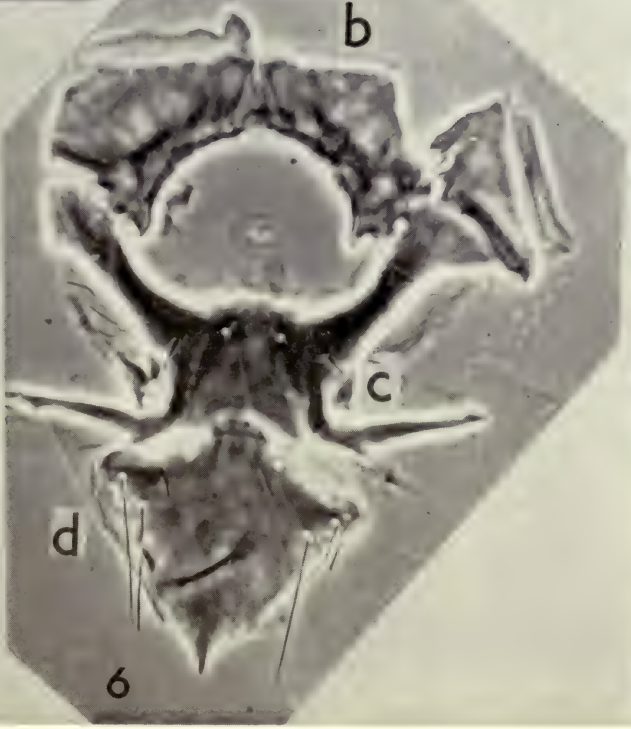

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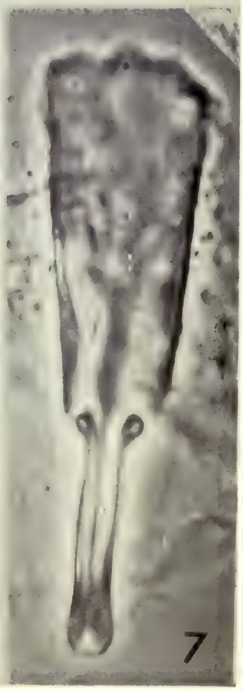
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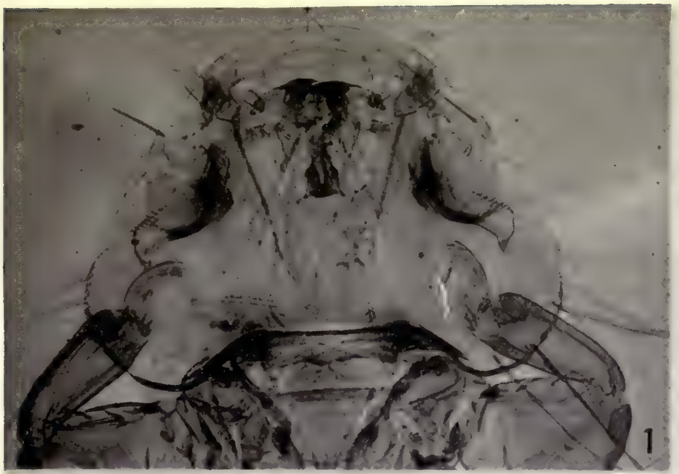
## PLATE 2

FIGS. 1–7. Female heads of *Myrsidea* spp. 1, *ishizawai* Uchida; 2, *sultanpurensis* Ansari; 3, *carrikeri* (Eichler) (B.M. Neg. 34252); 4, *abidae* Ansari (B.M. Neg. 34249); 5, *incerta* (Kellogg) (B.M. Neg. 34245); 6, *rohi* Ansari (B.M. Neg. 34253); 7, *varia* Ansari (B.M. Neg. 34243).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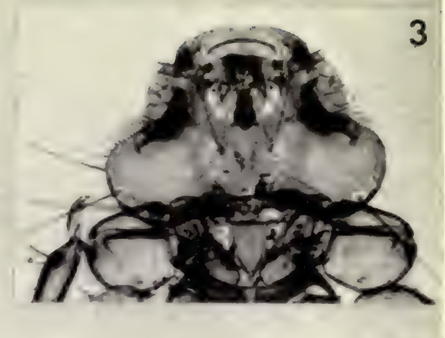
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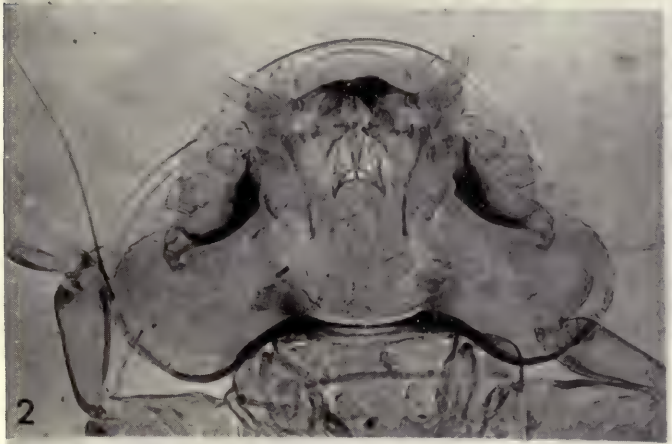
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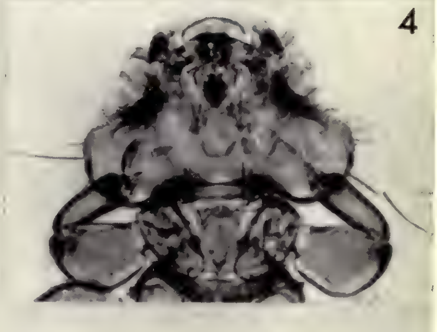
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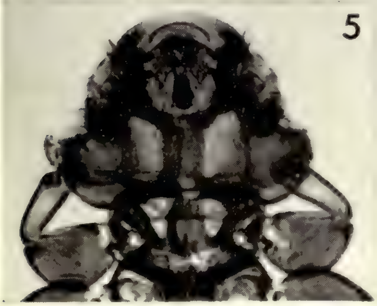
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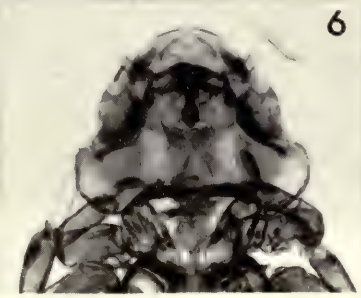
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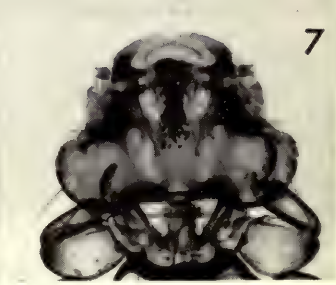
7

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# A REVISION OF THE BRITISH ALEYRODIDAE (HEMIPTERA : HOMOPTERA)

L. A. MOUND

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY Vol. 17 No. 9
LONDON : 1966

24 JAN 1

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BY

L. A. MOUND

Dept. of Entomology, British Museum (Nat. Hist.)

*Pp.* 397–428 ; 29 *Text-figures*

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THE BRITISH MUSEUM (NATURAL HISTORY)

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# A REVISION OF THE BRITISH ALEYRODIDAE (HEMIPTERA : HOMOPTERA)

*By* L. A. MOUND

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## SYNOPSIS

At present it is rarely possible to recognize species of whitefly when the only instar available for study is the adult. The generic classification is based on the morphology of the pupal cases, and species can be accurately defined on this instar if allowance is made for the occurrence of host-correlated variation in certain structures. Fifteen species are known in this country from their pupal cases, and these are figured and redescribed, and a key for their determination has been constructed. The record of a further species is not accepted as it is based only upon observations on adults. Three new synonymies and one new combination are given.

## INTRODUCTION

THE insects belonging to the family Aleyrodidae have been neglected to a remarkable extent by British entomologists. Nineteen species are listed in the 1964 edition of Kloet & Hincks, but in the following revision more than half of those entries have to be delected or altered in some way. Fifteen species placed in twelve genera are here considered to be validly recorded from this country, and there is one further species of which the record is regarded as doubtful.

The taxonomy of the Aleyrodidae is unusual in that species are more readily defined on characters of the " pupal case ", the exuvium of the fourth instar larva, than on the winged adults. It is barely possible to recognize even the British species of adult whitefly, and moreover it is not possible at present to associate the adults into genera. The basis of the generic classification was laid by Quaintance & Baker (1913 and 1914) using the pupal cases, and in view of the fact that this is the stage most frequently collected, most authors have adopted this system. Host plant records based on pupal cases are clearly of greater biological significance than records based on adults, which may alight fortuitously upon almost any plant. The difficulties encountered with the present classification are probably the result of more work on the group having been carried out in temperate regions, whereas most species occur in the tropics.

In recent years the accuracy with which species can be defined has been greatly increased. Russell (1948) has demonstrated that there are numerous characters to be observed on the pupal cases, although accurate observation of small pores and setae less than $3\mu$ in length necessitates the use of an oil-immersion objective as well as very careful preparation of the specimens. In the following pages, references to recent descriptions or descriptive details are given of all the species recorded from Britain, since several of these have never been described adequately. Earlier workers failed to define the species to which they were referring, and it was common practice to apply as specific epithet to a whitefly, the name of the host plant on which it was found, without attempting to recognize the species morphologically. Thus Trehan (1940) refers to a whitefly from *Corylus avellana* as *A. avellanae* Signoret, despite the fact that Signoret described his species as having spotted wings and Trehan's specimens had immaculate wings. In the same paper, Trehan refers to a species from *Carpinus* as *A. carpini* Koch, although the description of the latter is so vague that the name cannot be applied with accuracy to any species. For similar reasons, the records of *aceris* Geoffroy and *vaccinii* Künow from the North of England (Harrison, 1920) are not accepted here. Records are only acceptable if they are based on a microscopical examination of the pupal case and, where possible, comparison should be made with " type specimens " or other accurately determined material. Unless stated otherwise, material used in the following studies is deposited in the British Museum (Natural History).

One of the most interesting, and for the taxonomist, most disconcerting, aspects of the Aleyrodidae is the remarkable range of variation in appearance of the pupal cases of certain species. Moreover, this variation is to a large extent related to the type of leaf surface upon which the insect has developed. On a hairy leaf, pupal cases are usually small, with a deeply crenulate, often indented, margin and elongate dorsal setae. The same species on a smooth leaf may have a large pupal case with a smooth border and few or no elongate dorsal setae (Russell, 1948 on *Trialeurodes*; Mound, 1963 on *Bemisia*). The present author has recently examined a specimen of *Bemisia tabaci* from a grass leaf. This pupal case was very elongate, similar in shape to certain other grass living species, e.g. *Aleurocybotus*, and quite different in shape from typical *B. tabaci* on one of its many dicotyledonous hosts. This type of variation is very confusing and has given rise to numerous synonyms in certain species (Russell, 1958).

An interesting ecological problem is the remarkable persistence of individual populations of whitefly. Thus *T. ericae* has been known at Camberley, Surrey, on *Erica tetralix* for over thirty-five years. The populations of *S. phillyreae* and *P. azaleae* at Wisley must be of similar long standing, each on the same group of shrubs, throughout that period. The same appears to be true of the Ivy Whitefly, *S. immaculata*, for which the present author has frequently searched. Although this insect is quite widespread and the number of individuals at any one site may be large, populations are only rarely encountered. The existence of such long lived populations could be of considerable interest to the ecologist who wishes to study the interaction of predators and parasites with climate upon an insect population (Mound, 1965*a*).

The three species marked in the following list as having been found only in greenhouses in this country may not survive for long, as a result of improvements in chemical control of insects. However, the Greenhouse Whitefly *T. vaporariorum* is still all too common and is the most important pest in this family in Europe. *A. jelinekii*, *D. chittendeni* and *P. azaleae* may occasionally develop sufficiently large populations to be regarded as minor pests, whereas in tropical countries whitefly are important on a number of crops, e.g. Citrus (*Aleurocanthus woglumi*, *Dialeurodes citri*, *Aleurothrixus flocossus*), sugar cane (*Aleurolobus barodensis*, *Neomaskellia bergii*), coconut and cashew (*Aleurodicus cocois*). On cotton, tobacco and cassava, *Bemisia tabaci* is a pest both in its own right (Mound, 1965*c*) and as a virus vector (Tarr, 1951 ; Beck & Chant, 1958).

The list of host plants (page 424) was arranged systematically under families at the suggestion of Dr. V. F. Eastop, for whose frequent advice the author is very grateful. This systematic arrangement of plants draws attention to the different types of host association which can be found amongst the Aleyrodidae. Two species are almost certainly monophagous, *S. immaculata* on *Hedera*, and *T. ericae* on *Erica*. At the other extreme are *A. fragariae*, polyphagous on many herbs and under shrubs in Europe, and *B. tabaci* and *T. vaporariorum*, which have been found in various parts of the world on numerous plants, both monocotyledons and dicotyledons. Some whitefly have a host range which is basically limited to plants of known botanical affinity, such as *P. quercus* on Corylaceae and Fagaceae. But in other species the host range is not associated with botanical relationship, e.g. *A. jelinekii* on *Viburnum* and *Arbutus*. These two plants belong to widely different families, but it may be noted that they both have hard evergreen leaves. A similar relationship exists between the host plants of *A. proletella*, but in this case the leaves are soft and smooth. *A. fragariae*, it should be noted, has been found on both smooth and hairy leaves.

The author is pleased to acknowledge the help and advice of Mr. F. Laing, by whom the whitefly collection at the BM (NH) was developed and arranged.

## LIST OF SPECIES RECORDED FROM BRITAIN

*Aleyrodes proletella* (Linnaeus, 1758)
*Aleyrodes fragariae* Walker, 1852
?? *Aleurochiton complanatus* (Baerensprung, 1849)
† *Aleuropteridis filicicola* (Newstead, 1911)
*Aleurotrachelus jelinekii* (von Frauenfeld, 1867)
† *Aleurotulus nephrolepidis* (Quaintance, 1900)
*Asterobemisia avellanae* (Signoret, 1868)
* *Bemisia tabaci* (Gennadius, 1889)
*Dialeurodes chittendeni* Laing, 1928
† *Filicaleyrodes williamsi* (Trehan, 1938)
*Pealius azaleae* (Baker & Moles, 1920)
*Pealius quercus* (Signoret, 1868)
*Siphoninus phillyreae* (Haliday, 1834)
*Siphoninus immaculata* (Heeger, 1855)
*Tetralicia ericae* Harrison, 1917
*Trialeurodes vaporariorum* (Westwood, 1856)

?? Doubtful record, apparently refers only to adults.
* Status of species doubtful.
† Only in glasshouses in this country.

## PREPARATION OF MATERIAL FOR MICROSCOPICAL STUDY

The best mounts are obtained from pupal cases from which adults have emerged. It should be noted that the presence of a parasite often results in morphological changes in a whitefly pupal case and such specimens are best avoided. Pupal cases are picked from leaves with needles, placed in 10% sodium hydroxide, and heated gently for up to ten minutes depending on the age and size of the specimens. At the end of this period, cold glacial acetic acid is poured into the hydroxide causing the pupal cases to float and usually removing the cuticular wax. It is essential that this wax be removed before staining, and prolonged treatment with hydroxide should be avoided or much of the cuticular detail will be lost. Wash the specimens in glacial acetic acid and then stain with acid fuchsin for up to ten minutes. Black pupal cases need not be stained but should be bleached in Diaphanol or chlorine vapour. The stained material may be dehydrated in a mixture of equal parts of glacial acetic acid and cellosolve, then cleared in carbol-xylol, and finally xylol before mounting in Canada balsam. It is best to mount some specimens dorsal side and others ventral side up, although with certain species the dorsum can be removed from the ventral surface and the two mounted side by side.

### KEY TO GENERA

1 Median length of abdominal segment seven less than half that of segment six (Text-figs. 7 and 12) . . . . . 2

– Median length of abdominal segment seven more than half that of segment six, these two segments often about equal in length (Text-figs. 1 and 9) . . . . . 7

2 Expanded lingula tip at least twice as long as broad, elongate spatulate or conical in shape, vasiform orifice elongate triangular; abdominal segments four to eight each with one pair of subdorsal setae . . . . . 3

– Expanded lingula tip distinctly knobbed, never twice as long as broad . . . . . 4

3 Caudal furrow present; transverse moulting suture extends laterally **BEMISIA** (p. 413)

– Caudal furrow not developed; transverse suture extends laterally then curves to anterior meeting in mid-line of cephalic region . . **ASTEROBEMISIA** (p. 411)

4 Submarginal papillae present; marginal crenulations weak and irregular; lingula tip with three paired lateral, and one distal, lobes . . . . . 5

– Submarginal papillae absent; marginal crenulations well developed and regular . 6

5 Submarginal papillae conical; tracheal pore areas not well defined **TRIALEURODES** (p. 422)

– Submarginal papillae broad and shallow; tracheal pore areas well defined **FILICALEYRODES** (p. 416)

6 Lingula tip small, D-shaped, with two basal lobes; floor of vasiform orifice with many ridges . . . . . **PEALIUS** (p. 418)

– Lingula tip large, circular, extending beyond hind margin of orifice (in poor preparations, apparently D-shaped and included within orifice) **ALEUROTULUS** (p. 410)

7 Pupal case with black cuticle . . . . . 8

– Cuticle of pupal case white, colourless, or light brown . . . . . 9

8 Dorsal disc recurved ventrally, without dorsal wax . . **TETRALICIA** (p. 420)

– Dorsal disc not recurved ventrally, keeled in mid-line, dorsum with much wax **"ALEUROTRACHELUS"** (p. 410)

9 Dorsum with numerous tubes, each about 100 $\mu$ long . . **SIPHONINUS** (p. 419)

– Dorsum never with tubes, with or without long setae . . . . . . . 10

10 Dorsal disc recurved ventrally around margin, looking like a submarginal fold or suture . . . . . . . . ***ALEUROPTERIDIS*** (p. 408)

— Dorsal disc not recurved ventrally . . . . . . . . . . . 11

11 Operculum almost covers lingula; small paired setae close to caudal furrow just behind orifice; dorsal disc with numerous small tubercles **"*DIALEURODES*"** (p. 414)

— Operculum not covering lingula tip; without setae close to furrow behind orifice . 12

12 Vasiform orifice subcordate; lingula tip expanded, spatulate; pupal case pale ***ALEYRODES*** (p. 403)

— Vasiform orifice widely open at posterior; lingula tip scarcely expanded; pupal case light brown with darker markings . . . . ***ALEUROCHITON*** (p. 407)

## Family **ALEYRODIDAE** Westwood, 1840

## Subfamily **ALEYRODINAE**

All the species recorded from this country belong to one subfamily. The species of the other subfamily, the Aleurodicinae Qu. & B., 1913, are mainly described from South America.

### ***ALEYRODES*** Latreille, 1796

Type-species, *Phalaena* (*Tinea*) *proletella* Linnaeus, 1758.

This, the first whitefly genus to be named, was defined by Latreille and placed as the sole genus in a new, but unnamed, family in 1796 (p. 93). No species were included at this date but the publication is valid, as in 1801–2 (p. 264) Latreille redefined the genus and added " Exemples, *Tinea proletella* Lin. (Et quelques pucerons) ". It should be noted that he had first indicated the hemipterous nature of *proletella* in 1795 (p. 304).

Linnaeus first published the name *proletella* under *Phalaena* (*Tinea*) in 1758, *Systema Naturae*, ed. **10** : 537, no. 261, but his description " alis albidis punctis duobus fuscis, lingua inflexa " was followed by a " dagger mark " †. This mark is interpreted by Stearn (1957 : 162) as indicating either that Linnaeus had not seen the species or that there was some doubt about it. In the Twelfth Edition, the same entry is given, but under number 379. However in the revision by Gmelin (1790 : 2594), the Thirteenth Edition, the entry is followed by the words " an hujus familiae? ". It seems likely that Linnaeus never observed the species himself, particularly as neither first nor second edition of *Fauna Suecica* (1746 and 1761) contain any reference to it.

The identity of the insect species referred to by Linnaeus under the name *proletella* is clarified from a study of the rest of the entry which follows his description quoted above, " Vallisn. nat. 1. p. 372. t. 379 ; Reaum. ins. 2. t. 25 ; Habitat in Brassica, Chelidonio ; an etiam in Quercu ? Parit quotannis ad 200000 soboles ; dum 12 progenies ponant 12 ova singulae." Réaumur (1736 : 302–317, plate 25) gives a good account of the life history of the insect on " L'éclaire " (Greater Celandine, *Chelidonium major*) and also gives reasons for considering this as the same species as that found on cabbage. Seventeen figures are included and the structure of the rostrum is contrasted with the coiled mouth-parts of other " phalènes ". The author goes so far as to suggest that this insect might be placed in a new class of moths on account of this character as well as the waxy nature of the powder covering the wings. The reference to Vallisneri (1733 : 372–378), which is also given by Réaumur, is to a long letter from Cestoni giving an account of the behaviour of the cabbage whitefly. The emergence of the winged adult from the sessile larva is described, and this article goes on to state that the insect is not only found on cabbage, but also on oak, various grasses, and other plants both " comestibili e non comestibili ". From this it is almost certain that Cestoni was concerned with more than one species. However, as Linnaeus gives only *Brassica* and *Chelidonium* as definite hosts for his species, this is an indication that *proletella* refers to the common European Cabbage Whitefly, as discussed and figured by Réaumur from *Chelidonium*.

Only two valid species of the genus *Aleyrodes* are recorded from the British Isles, and the pupal cases of these may be separated by the use of the following key :

Vasiform orifice smoothly rounded at posterior, lateral margins without tooth-like ridges; abdomen without median tubercles but with transverse rows of minute microtrichia; caudal setae usually extend little beyond body margin; three pairs of major dorsal setae equal in length to caudal setae . ***A. proletella*** (p. 404)

Vasiform orifice sharply transverse at posterior, with terminal triangular lobe, lateral margins with tooth-like ridges; abdomen usually with median tubercles; caudal setae extend well beyond body margin usually; often more than three pairs of major dorsal setae, up to six pairs, equal in length to caudal setae ***A. fragariae*** (p. 406)

## ***Aleyrodes proletella*** (Linnaeus)

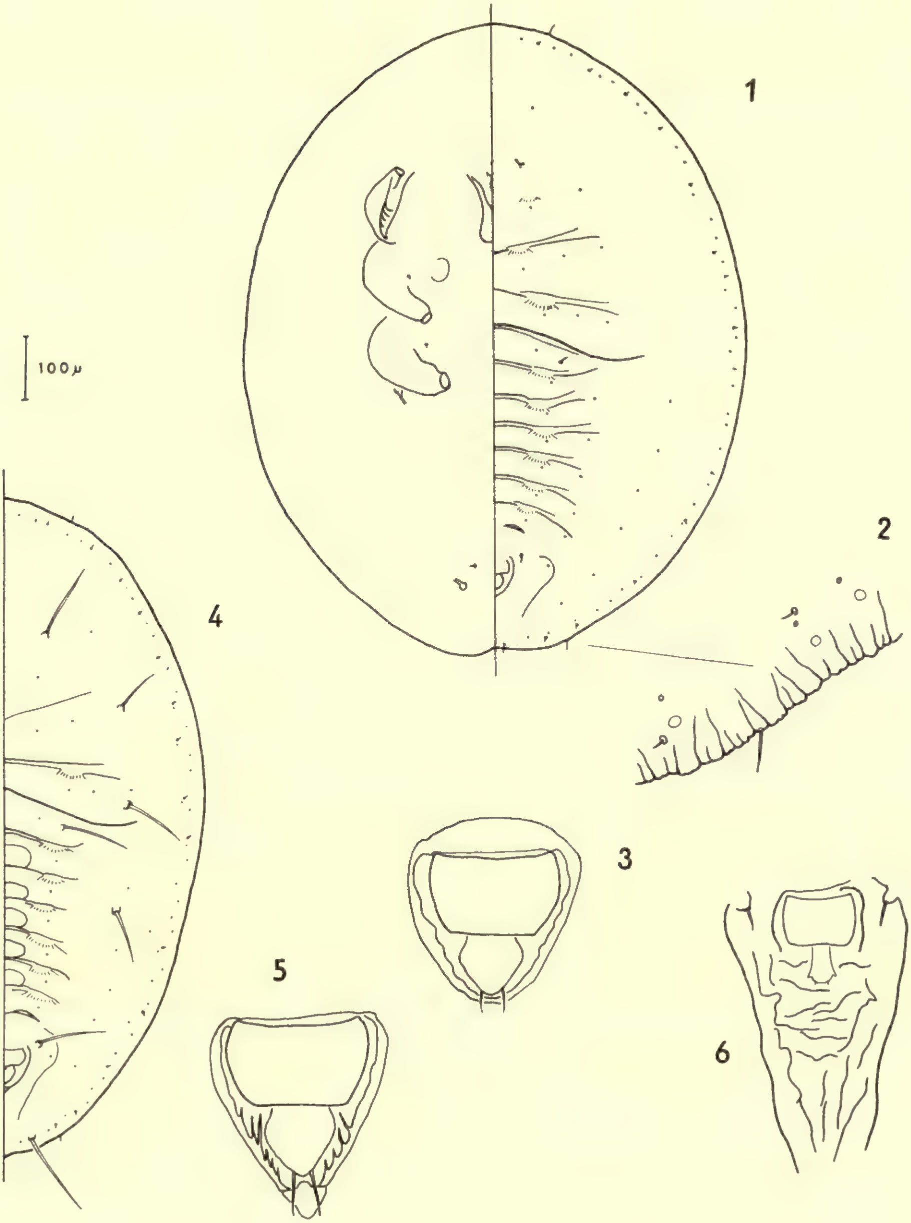
(Text-figs. 1–3)

*Phalaena* (*Tinea*) *proletella* Linnaeus, 1758.
*Phalaena culiciformis* Geoffroy in Fourcroy, 1785 : 306.
*Aleyrodes proletella* (L.) Latreille, 1801–2.
*Aleyrodes chelidonii* Latreille, 1807.
*Aleyrodes brassicae* Walker, 1852.

The specific epithets *culiciformis* and *chelidonii* were both proposed as new names for the whitefly of *Chelidonium major*. *A. brassicae* was stated by Walker in his description to be " possibly a variety of " the Chelidonium Whitefly, and Haupt (1935) and Trehan (1940) have both indicated that *brassicae* is a synonym of *proletella*.

*A. proletella* is common throughout England and occasionally is a pest on cabbages and Brussels sprouts. It occurs throughout the year and it is not unusual to find adults in January moving freely on leaves bearing snow and frost. The geographical distribution of the species has yet to be discovered but the present author has examined material from Nairobi, Kenya, on *Sonchus*, from an unknown host at Bahia, Brazil, and from *Vicia* and *Cichorium* at Alexandria, U.A.R.

*Pupal case*. Usually on lower surface of leaves, White, occasionally with faint pigmentation laterally on cephalo-thorax, sometimes yellowish particularly when parasitized. Living fourth instar often yellow/green due to body contents, or apparently black when containing parasite pupal case. Rarely with marginal wax. Length 1·3–1·5 mm. Breadth 0·8–0·9 mm.



FIGS. 1–6. 1. *Aleyrodes proletella,* dorsal and ventral surfaces. 2. *A. proletella,* posterior margin. 3. *A. proletella,* vasiform orifice. 4. *Aleyrodes fragariae,* dorsal surface. 5. *A. fragariae,* vasiform orifice. 6. *Aleurochiton complanatus,* vasiform orifice.

*Margin.* Smoothly crenulate, 8–10 crenulations in 50 μ. Weak ridges, about 30 μ long, run medially from crenulations. If margin is not quite flat, these ridges appear like stout crenulations. Anterior and posterior marginal setae present, 10–15 μ long. Caudal setae submarginal in origin, about 15 μ long, arising 10 μ within margin. Tracheal pore areas not differentiated.

*Dorsal surface.* Three pairs of major setae, 10–15 μ long, on cephalic region, and first and eighth abdominal segments. Eighth abdominal setae lateral to anterior margin of operculum, about 15 μ from orifice. Fourteen pairs of minor dorsal setae, 3 μ in length or shorter, about 25 μ from margin. These setae arranged as follows ; cephalic region four pairs, prothorax one pair, mesothorax two pairs, metathorax one pair, first abdominal segment one pair, abdominal segments four to eight each with one pair. These setae most obvious on posterior abdominal segments, often concealed by rolling of margin or submarginal ridges. Transverse moulting suture short, reaches external margin of legs, barely turns to anterior, pupal case often torn in this region. Thoracico-abdominal suture visible medially just posterior to transverse moulting suture. Abdominal rhachis weakly defined, with transverse rows of finest microtrichia. Abdominal sutures extend to subdorsum, sutures one to seven with paired submedian depressions. First and second abdominal sutures bend to anterior. Segments one to six, and eight subequal in length, seven shorter, about three-quarters of six in mid-line. Abdomen with four paired rows of pores; submedian, posterior to submedian depressions ; latero-median, near lateral extremities of segmental sutures ; subdorsal ; and submarginal, close to minor setae. Latero-median and subdorsal pores absent on segment two. Each pore is accompanied by a circular area which fails to stain as deeply as the surrounding cuticle. These structures (pseudopores) lie close to the pores on the rhachis, but in the submarginal row the pseudopores are much closer to the margin than the pores. Pores and pseudopores irregular in number in submarginal row. Vasiform orifice slightly wider than long, length 65 μ, breadth 75 μ approximately. Lateral margins not toothed, internal surface lightly sculptured, posterior margin entire. Operculum transversely rectangular, occupies less than half of orifice, about 30 μ long. Lingula exposed but included within orifice, lingula tip usually as broad as long, sometimes rather longer than broad, paired terminal setae extend beyond orifice margin. Caudal ridges very weakly defined.

*Ventral surface.* Meso- and metathoracic legs each with a minute (2 μ) seta basally. One pair of small setae just anterior to rostrum, 5 μ long and about 5 μ apart. Ventral abdominal setae antero-medial of posterior spiracles, 15 μ long and about 50 μ apart. Anterior abdominal spiracles larger than posterior spiracles, tracheal folds not differentiated. Antennae extend to base of first leg.

Host plants : *Brassica* spp., *Chelidonium major*, *Sonchus* sp., *Vicia faba*, *Cichorium* sp.

## ***Aleyrodes fragariae*** Walker, 1852

(Text-figs. 4–5)

*Aleyrodes lonicerae* Walker, 1852, **syn. n.**
*Aleurodes spiraeae* Douglas, 1894, **syn. n.**

Zahradnick (1963), as well as several other authors, gives *A. fragariae* as a synonym of *A. lonicerae.* However *A. fragariae* appears as the third species of *Aleyrodes* in Walker's List of Homoptera, and *A. lonicerae* as the fourth. The descriptive details of *A. fragariae* are given in the list in the definition of the second species, *A. brassicae.* Thus *fragariae* must be regarded as the first available name. *A. spiraeae* was described by Douglas from several adults and a single pupal case on the leaves of

Meadow-Sweet (*Filipendula Ulmaria*). This pupal case has now been stained and mounted in Canada balsam at the British Museum (Natural History) and is recognizable as a parasitized specimen of *A. fragariae.*

The Strawberry Whitefly is polyphagous, and is common throughout Britain. Adults and larvae may be found all through the year, but the species seems to be particularly common in years with a hot dry summer. The variation in number of the long dorsal setae of the pupal case is referred to by Trehan (1940).

*Pupal case.* Very similar to *proletella*, sometimes with a more distinct waxy fringe on hairy leaves.

*Margin.* As in *proletella* but caudal setae more than 80 μ long.

*Dorsal surface.* Major setae very variable in number and size, rarely small, usually 50 μ to 100 μ long. Paired major setae on cephalic region, and first and eighth abdominal segments ; also frequently developed in subdorsal region on meso- and metathorax, and fourth abdominal segment, i.e. six pairs of major dorsal setae. Submarginal setae as in *proletella.* Rhachis quite well defined, with rounded median tubercles. Abdominal segments subequal in length, segment seven not so distinctly shorter than six and eight as in *proletella.* Vasiform orifice as long as, or longer than wide, length 75 μ, breadth 70 μ approximately. Lateral margins with tooth-like ridges, inner surface lightly sculptured, posterior margin transverse with an additional posterior triangular lobe. Operculum and lingula as in *proletella.* Caudal ridges moderately developed.

*Ventral surface.* As in *proletella* except caudal tracheal fold indicated by minute raised dots.

Host plants. *Fragaria vesca, Geum arvense, Rubus fruticosus, Filipendula Ulmaria* (Rosaceae) ; *Lonicera periclymenum, Symphoricarpos racemosus* (Caprifoliaceae) ; *Nepeta glechoma, Teucrium scorodonium* (Labiatae) ; *Melampyrum pratense* (Scrophulariaceae) ; *Thalictrum babingtonii* (Ranunculaceae) ; *Hypericum andraesemum* (Hypericaceae) ; *Campanula trachelium* (Campanulacae) ; *Cardamine amara* (Cruciferae) ; *Chamaenerion angustifolium* (Onagraceae) ; *Aegopodium podagrica* (Umbelliferae).

## ***ALEUROCHITON*** Tullgren, 1907

Type-species, *Chermes aceris ovatus* Geoffroy, 1762, a synonym of *Aleyrodes complanatus* (Baerensprung, 1849), after Schumacher, 1918.

The trinomial *Chermes aceris ovatus* as used originally by Geoffroy in 1762 has to be rejected according to the Rules of International Zoological Nomenclature. The binomial *Chermes aceris* used by Geoffroy in 1785 must also be rejected as a homonym of *Chermes aceris* Linnaeus, 1758. According to Schumacher (1918) the next available name for this insect is *Lecanium complanatum* Baerensprung, 1849. There are two species belonging to this genus in Central Europe, *A. complanatus* and *A. acerina* Haupt, on *Acer platanoides* and *campestre* respectively. A related species *Neoaleurochiton pseudoplatani* Visnya is found in Central Europe on *Acer pseudoplatanus.*

### ***Aleurochiton complanatus*** (Baerensprung)

(Text-fig. 6)

*Chermes aceris ovatus* Geoffroy, 1762.
*Chermes aceris* Geoffroy, 1785 nec Linnaeus, 1758.
*Lecanium complanatum* Baerensprung, 1849.
*Aleyrodes acerum* Kirkaldy, 1907.
*Aleurochiton aceris* (Geoffroy) Tullgren, 1907.
*Aleurochiton complanatus* (Baerensprung) Schumacher, 1918.

This species was recorded from the North of England by Harrison (1920), apparently as a result of observing adult whitefly on the leaves of *Acer pseudoplatanus*. No reference was made to the presence of pupal cases, and in view of the large size and striking appearance of the immature instars with their white dorsal wax, it can only be assumed that Harrison did not observe any. In view of the fact that certain species of adult whitefly will settle on almost any plant when they are sufficiently numerous, it seems better at the moment to consider the presence of *A. complanatus* in this country as unproven.

## ***ALEUROPTERIDIS*** Mound, 1961

Type-species, *Aleuropteridis douglasi* Mound, 1961, a synonym of *Aleurodes filicicola* Newstead, 1911, after Mound, 1965*b*.

This genus was defined for four new species, all of which had been found on ferns. The dorsal disc is reflexed ventrally around the margin, as in *Tetralicia* and *Aleuropleurocelus*, but less deeply and more evenly than in those two genera.

### ***Aleuropteridis filicicola*** (Newstead)

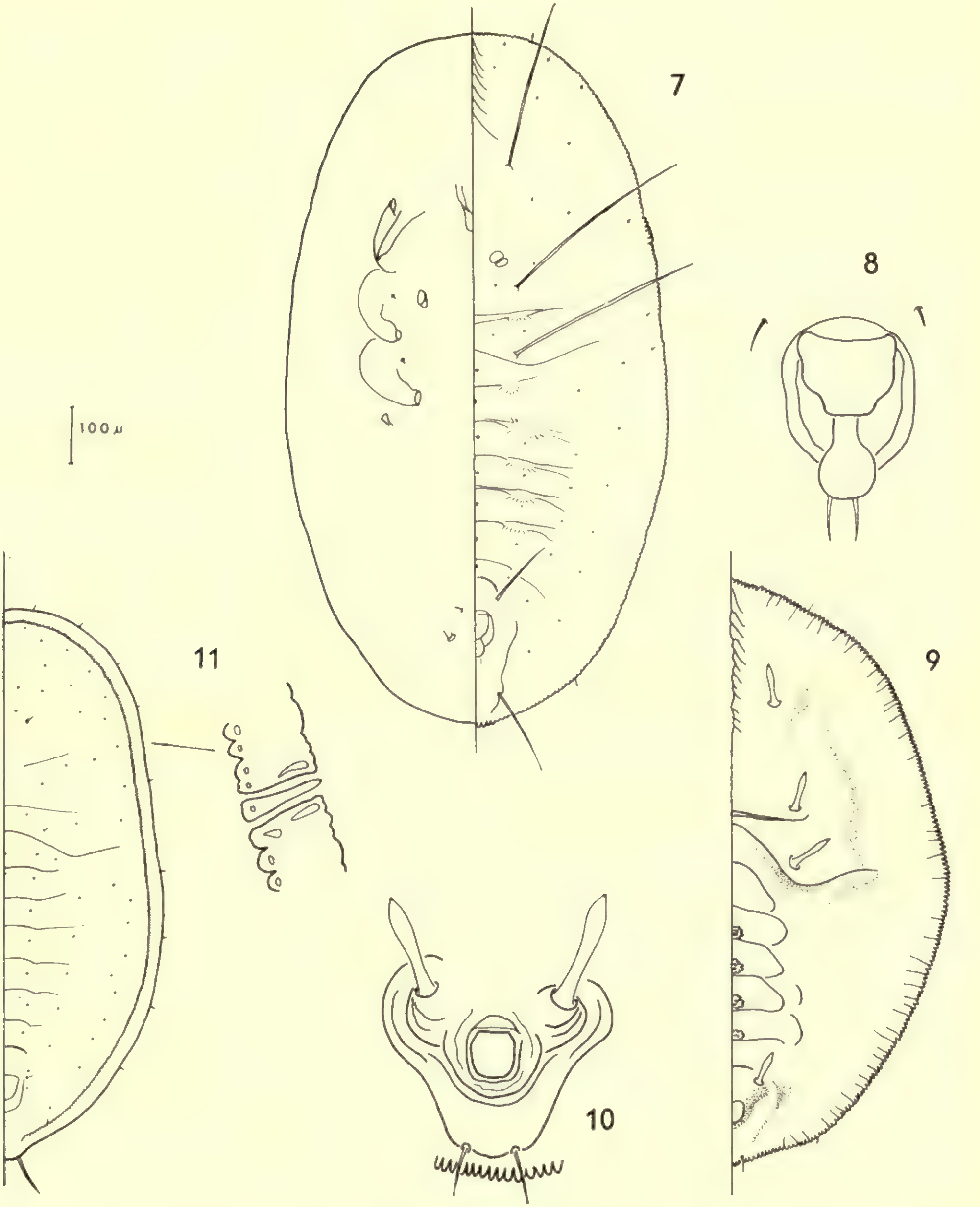
(Text-fig. 11)

*Aleyrodes filicicola* Newstead, 1911.
*Aleuropteridis douglasi* Mound, 1961.
*Aleuropteridis filicicola* (Newstead) Mound, 1965*b* : 135.

Described originally from Tanganyika, this species was redescribed under the name *douglasi* from material collected by J. W. Douglas on ferns in Kew Gardens. The leaves of the ferns were deposited in the British Museum (Natural History). This is the species referred to by Trehan (1938) as " *Aleyrodes filicium* " when distinguishing a new species *Aleuroplatus kewensis* = *Aleurotulus nephrolepidis*.

*Pupal case.* Pale with median longitudinal brown band. Margin with vertical wax palisade. Elongate ovate, narrowed to posterior. Length 0·8 mm. Breadth 0·4 mm. Small paired setae on cephalic, metathoracic and eighth abdominal segments. Caudal setae longer than orifice. True margin reflexed ventrally, apparent margin with nine pairs of small setae. Tracheal pore areas defined by about three enlarged teeth. Operculum three-quarters fills subrectangular orifice, concealing lingula.

Host plants. *Pteris togoensis*, *Cyclosorus dentatus*, *Oleandra articulata*.



FIGS. 7–11. 7. *Aleurotulus filicium*, dorsal and ventral surfaces. 8. *A. filicium*, vasiform orifice. 9. *Aleurotrachelus jelinekii*, dorsal surface. 10. *A. jelinekii*, vasiform orifice and hind margin. 11. *Aleuropteridis filicicola*, dorsal surface and detail of thoracic tracheal pore.

## *ALEUROTRACHELUS* Quaintance & Baker, 1914

Type-species, *Aleyrodes tracheifer* Quaintance, 1900.

The species referred to below is not congeneric with *A. tracheifer*, but as this is true of a number of species at present included in that genus, it seems best to leave it until such time as a generic revision can be attempted.

### *Aleurotrachelus jelinekii* (von Frauenfeld)

(Text-figs. 9–10)

*Aleurodes jelinekii* von Frauenfeld, 1867.
*Aleyrodes* (*Frauenfeldiella*) *jelinekii* (Frauen.) Gomez Menor, 1943.
*Aleurotrachelus jelinekii* (Frauen.) Fowler, 1954.

Although apparently an introduced species, this insect is widespread in Southern England, and occasionally so abundant as to be a pest on its host plant, the ornamental shrub *Viburnum tinus*. As an account of the species has been published recently (Mound, 1962) a full description is not included here.

*Pupal case.* Black, with dorsal rolls of flocculent white wax, and white waxy marginal fringe. Length 1·1 mm. Breadth 0·8 mm. Oval, barely constricted at thoracic tracheal pores, dorsum elevated in mid-line. Paired stout setae, apparently secretory, on cephalic region, meso- and metathorax, and eighth abdominal segment. Cephalothorax with a longitudinal ridge on each side in subdorsum. Vasiform orifice elongate rectangular, filled by operculum, which conceals lingula.

Host plants. *Viburnum tinus, Arbutus unedo.*

## *ALEUROTULUS* Quaintance & Baker, 1914

Type-species, *Aleurodes nephrolepidis* Quaintance, 1900.

This is a very poorly known genus, in which are included, apart from the type-species, four species known only from their original descriptions.

### *Aleurotulus nephrolepidis* (Quaintance, 1900)

(Text-figs. 7 and 8)

*Aleurodes filicium* Douglas, 1891*a* nec Goeldi, 1886.
*Aleuroplatus kewensis* Trehan, 1938. **syn. n.**

In 1886 Goeldi described a whitefly, *A. filicium*, from ferns in Brazil. The description of this insect includes the statement (in italics) that there are five pairs of very long setae on the ventral surface (Bauchseite) for attachment to the substrate (zum Anhaften auf der Unterlage.) *A. nephrolepidis* differs from the description of *A. filicium* in having five pairs of setae on the dorsal surface, a fairly common condition in the Aleyrodidae. The arrangement of setae described by Goeldi is so remarkable that one is tempted to conclude that he had made an extraordinary mistake. In view of this, the best course of action is to regard *filicium* as a nomen dubium. The species of *Aleurotulus* on ferns in England is *A. nephrolepidis*, and the present author, after examining the type specimens of *A. nephrolepidis*, by the courtesy of the United States National Museum, and *A. kewensis*, at the British Museum (Natural

History) considers them to be the same species. In view of the fact that this whitefly has been recorded from both America and Europe on ferns in greenhouses, the following record is of considerable interest : Madagascar, on *Oleandra articulata*, in Buckton Collection at British Museum (Natural History), date uncertain, but before 1911.

*Pupal case.* White, elliptical in shape, with small marginal fringe of pale wax. Slightly elevated in mid-line. Length 0·8–1·0 mm. Breadth 0·5–0·65 mm.

*Margin.* Distinctly crenulate, about 12 crenulations in 100 μ. Tracheal pore areas indicated by slight expansion of four or five crenulations. Anterior and posterior marginal setae present.

*Dorsal surface.* Up to five pairs of long setae, including caudal setae. Caudal setae always long, about 125 μ, submarginal in origin, 40 μ within margin. Major dorsal setae short (5 μ), or long (up to 200 μ), on cephalic region, meso- and metathorax, and eighth abdominal segment. Eighth abdominal setae arise just anterior to orifice. Six pairs of minute submarginal setae (3 μ), three pairs in cephalic region, one pair on prothorax, one on metathorax, and one on first abdominal segment. Meso-metathoracic suture well developed. Transverse moulting suture reaches outer border of leg. Abdominal sutures weakly defined into subdorsum, seventh abdominal segment less than half length of six. Subdorsal region smooth or lightly sculptured. Dorsal pores in four paired rows on abdomen ; submedian, posterior to submedian depressions ; latero-median, near lateral extremities of abdominal sutures ; subdorsal ; and submarginal. Also an unpaired median row of segmental pores on rhachis. Vasiform orifice slightly longer than broad, 65 μ × 50 μ, elevated slightly causing rounded posterior margin to appear thickened. Anterior rim distinct, 10 μ long. Lingula tip large, circular, with stout terminal setae, extending well beyond posterior margin of orifice. Lingula frequently retracts into orifice during mounting, tip then appears D-shaped. Operculum narrowed posteriorly, fills more than half of orifice.

*Ventral surface.* Anterior abdominal spiracle well developed. Thoracic tracheal folds barely, indicated, caudal fold with numerous minute microtrichia. Ventral abdominal setae 20 μ long, 45 μ apart at base. Meso- and metathoracic legs each with one basal seta. Antenna not reaching base of first leg.

## *ASTEROBEMISIA* Trehan, 1940

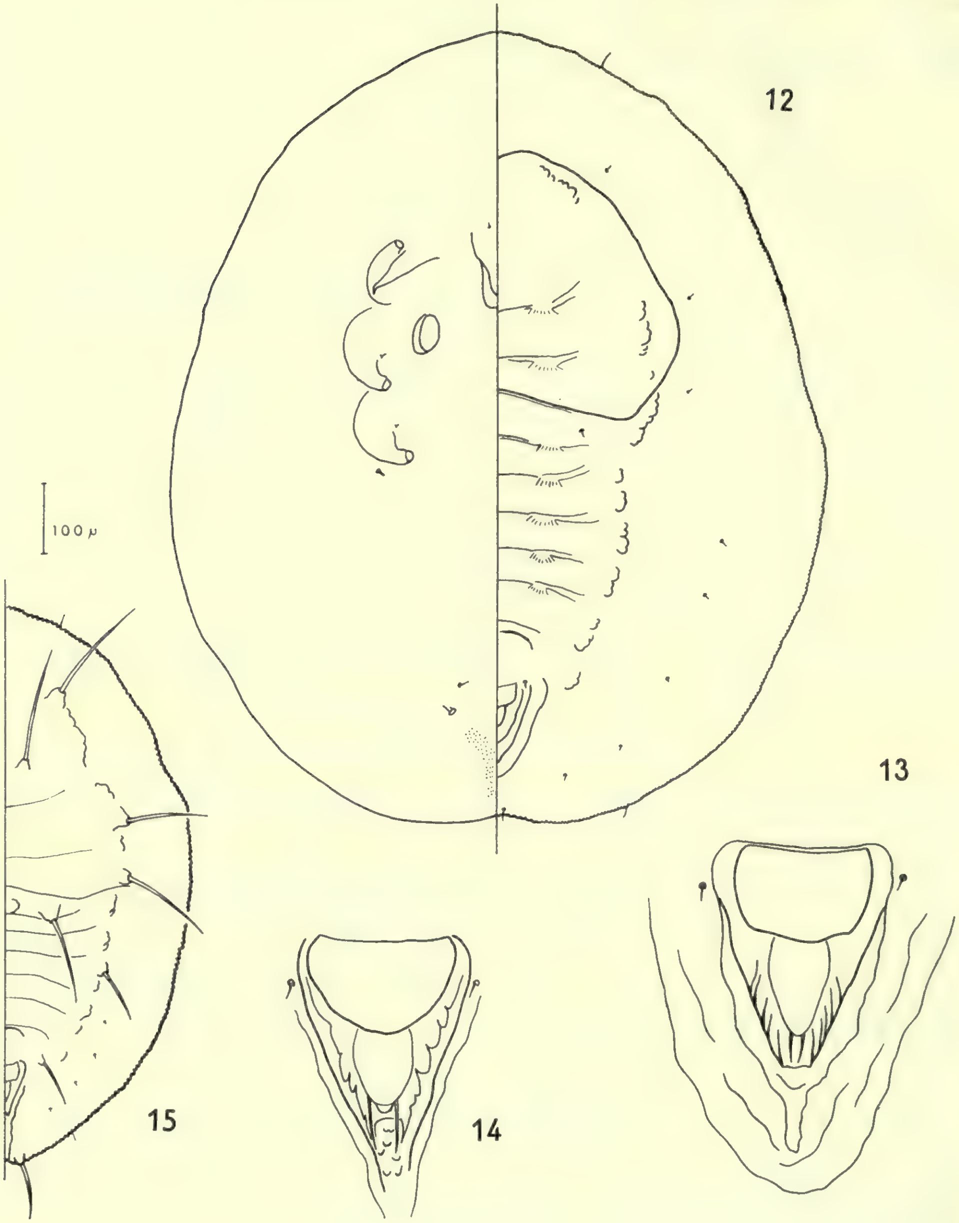
Type-species, *Aleurodes carpini* of Trehan nec Koch, 1857, a synonym of *Aleyrodes avellanae* Signoret, 1868, after Zahradnik, 1961.

The description of *A. carpini* Koch is an entirely inadequate account of an adult whitefly, and cannot be referred to any known species with accuracy. However the species that Trehan used when describing *Asterobemisia* can definitely be recognized as *A. avellanae*, because Signoret's collection of pupal cases still exists and has been examined by Zahradnik (1961). *Asterobemisia* is therefore regarded as a valid genus with *avellanae* Signoret as the type-species.

### ***Asterobemisia avellanae*** (Signoret)

(Text-figs. 12–13)

*Aleurodes avellanae* Signoret, 1868.
*Aleurodes ribium* Douglas, 1888. [Syn. Ossiannilsson, 1955]
*Aleurodes rubicola* Douglas, 1891*b*. [Syn. Trehan, 1940]
? *Aleurodes vaccinii* Künow, 1880. [Syn. Zahradnik, 1963]
*Asterochiton avellanae* (Sign.) Harrison, 1920.
*Asterobemisia carpini* Trehan, 1940 nec Koch, 1857. [Syn. Zahradnik, 1961]
*Asterobemisia avellanae* (Sign.) Zahradnik, 1961.



Figs. 12–15. 12. *Asterobemisia avellanae*, dorsal and ventral surfaces. 13. *A. avellanae*, vasiform orifice. 14. *Bemisia tabaci*, vasiform orifice. 15. *B. tabaci*, dorsal surface.

Both of the nominal species, *ribium* and *rubicola*, described by Douglas, are represented in the collection at the British Museum (Natural History) by the original author's material. Lectotypes are here designated from this material although both forms are identical with *A. avellanae*. *A. ribium* Douglas, lectotype pupal case, collected 23rd October, 1887, no locality given. *A. rubicola* Douglas, lectotype pupal case, collected 15th June, 1891, Bramble leaves, Blackheath Pits, 1244.

*A. avellanae* is apparently widespread in England, from Northumberland to the South Coast. A description has been published recently by Zahradnik (1961).

*Pupal case*. White, with little wax. Length 1·0–1·3 mm. Breadth 0·9–1·0 mm. Broadly oval, slightly emarginate at thoracic and posterior tracheal pores. Margin sometimes deeply indented due to proximity of leaf hairs during development. Caudal setae short, little longer than anterior and posterior marginal setae. Dorsal setae small to minute (5–15 $\mu$), on cephalic region, and first and eighth abdominal segments, also subdorsally on abdominal segments four to eight. Transverse moulting suture bends to anterior and meets in mid-line. Seventh abdominal segment short, less than half length of sixth segment. Median area usually divided from subdorsum by row of tubercles. Vasiform orifice triangular, lingula spatulate, exposed, included. No caudal furrow, caudal ridges meet just behind orifice forming a triangular area. Thoracic tracheal folds not strongly marked, posterior fold indicated by rows of raised dots.

Host plants. *Corylus avellana*, *Carpinus betulus*, *Rubus* spp.

## ***BEMISIA*** Quaintance & Baker, 1914

Type-species, *Aleurodes inconspicua* Quaintance, 1900, a synonym of *Aleurodes tabaci* Gennadius, 1889, after Russell, 1958.

Species included in this genus have an elongate triangular vasiform orifice, usually with an exposed triangular lingula tip. There is a series of subdorsal setae which are often overlooked when small, but are occasionally long and stout.

### ***Bemisia tabaci*** (Gennadius, 1889)

(Text-figs. 14–15)

This species is remarkable for the extraordinary amount of variation which occurs in the pupal case. As a result, numerous synonyms exist (Russell, 1958), and several probably await detection. Thus *B. minima* and *B. miniscula*, described by Danzig (1964) from Russia, appear from their descriptions to fall within the known limits of variation of *B. tabaci*, and have yet to be shown to differ from this widespread polyphagous species. The variation in *tabaci* is related to the nature of the host plant leaf on which a pupal case develops. On hairy leaves, pupal cases are often small with long dorsal setae, whilst on glabrous leaves they are large with very small setae, and this variation has been demonstrated experimentally (Mound, 1963). Variants of this type have previously been regarded as host specific species, but host correlated variation is not uncommon throughout the Aleyrodidae (Mound, 1965*b*).

*B. tabaci* has only been found once in England, and the record has not been published hitherto. The species was collected by Dr. A. M. Massee on *Veronica* sp. at East Malling, Kent, in July 1943. As it was found in the middle of a wood over quite a restricted area, Dr. Massee (in litt.) considered that it was unlikely to have been introduced from glasshouses. The species is widespread throughout the tropics and subtropics, and it is frequently a pest (Mound, 1965*a* and *c*). It is extremely polyphagous, and it would be very interesting to know if it can overwinter in this country. As a discussion of the variation of the pupal case was published recently (Mound, 1963), the species is only figured here without further descriptive details.

## ***DIALEURODES*** Cockerell, 1902

Type-species, *Aleurodes citri* Ashmead, 1885.

When the species, which is discussed below, was described, Laing (1928) pointed out that " Though the species is not typically a *Dialeurodes*, it may conveniently rest in that genus until the classification of the family is better understood."

### ***Dialeurodes chittendeni*** Laing, 1928

(Text-fig. 18)

*Aleuroclava chittendeni* (Laing) Takahashi, 1938.

The Rhododendron Whitefly was collected originally in this country near Ascot, where in 1928 it caused considerable damage to its host plant. It does not seem to be very common now, even in its type locality where rhododendrons are abundant. The species was referred to the genus *Aleuroclava* by Takahashi (1938), but it is not related to the four species at present included in that genus, none of which, it may be noted, are very closely related to each other. The generic affinities of *D. chittendeni* appear to lie with certain Indo-Malaysian species described in, but not belonging in, the genus *Trialeurodes*, e.g. *T. bicolor* Singh, and *T. malayensis* Corbett. The following redescription is based on the holotype and paratypes in the British Museum (Natural History).

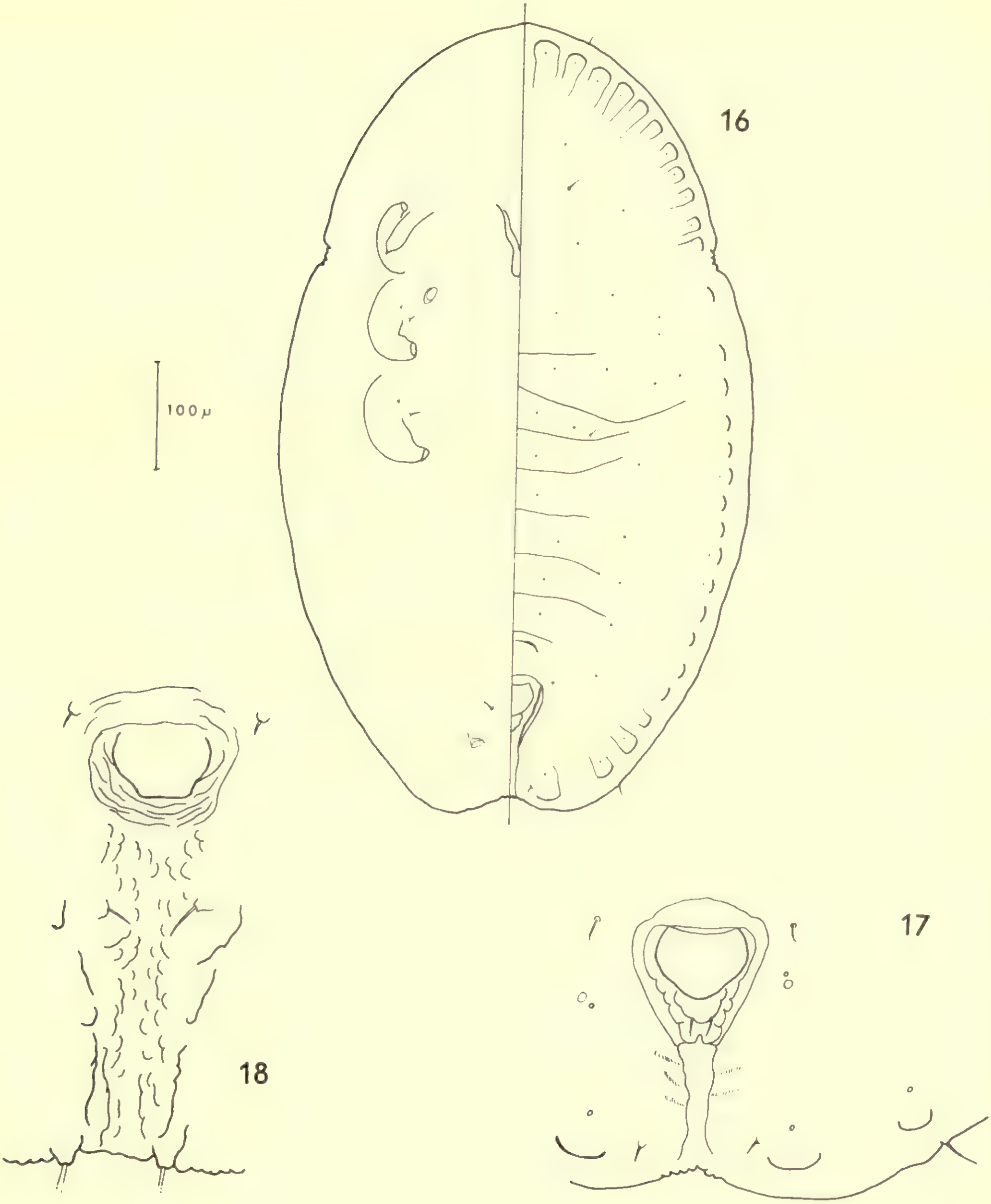
*Pupal case.* White, with little wax, broadly oval, slightly emarginate at posterior. Length 1·25 mm. Breadth 0·9 mm.

*Margin.* Finely crenulate, about 20 crenulations in 100 μ. Paired anterior and posterior marginal setae present, 10–30 μ long. Caudal setae on small papillae close to caudal furrow, 15–30 μ.

*Dorsal surface.* Paired dorsal setae present as follows; cephalic region (15–30 μ long); first abdominal segment, often absent (15–20 μ long); eighth abdominal segment, and posterior to vasiform orifice (10–15 μ long). Submarginal setae (5–15 μ) developed as follows; cephalic region, four pairs; prothorax, one pair; mesothorax, two pairs; metathorax, one pair; abdominal segments one, and four to eight each with one pair, i.e. fourteen pairs. Dorsal surface with numerous small tubercles. Transverse moulting suture extends to subdorsum, ends posterior to its mid-point. Abdominal segments subequal in length in mid-line. Vasiform orifice subcircular, wider than long, 40 μ × 55 μ, not cleft at posterior but with several anastomosing lines. Operculum narrowed at posterior, lingula tip barely exposed. Caudal furrow well defined by numerous small tubercles, caudal ridges not large.

*Ventral surface.* Anterior abdominal spiracles well developed, tracheal folds poorly defined. Ventral abdominal setae 35 μ long, 50 μ apart. Meso- and metathoracic legs each with one small basal seta, 3 μ long. Small paired setae anterior to rostrum, 8 μ long.

Host plants. *Rhododendron* spp.



FIGS. 16–18. 16. *Filicaleyrodes williamsi*, dorsal and ventral surfaces. 17. *F. williamsi*, vasiform orifice. 18. *Dialeurodes chittendeni*, vasiform orifice and caudal furrow.

## *FILICALEYRODES* Takahashi, 1962

Type-species, *F. bosseri* Takahashi, 1962.

This genus was distinguished by Takahashi from *Trialeurodes* by the presence of tracheal pores, a sclerotized ring around the vasiform orifice, the truncated submarginal papillae, and the well developed caudal ridges. In addition to syntypes of *bosseri*, the present author has examined two further species belonging to this group, *T. williamsi* Trehan, and a new undescribed species from Tanganyika taken on ferns. From a study of this material, it is clear that *Filicaleyrodes* is very close to *Trialeurodes*, with which it may prove eventually to be synonymous. The ring around the orifice found in *bosseri* is not so well developed in the other two species referred to above, but all three species differ from *Trialeurodes* in their well developed tracheal pores, and in having submarginal papillae three times as broad as long.

### ***Filicaleyrodes williamsi*** (Trehan) **comb. n.**

(Text-figs. 16–17)

*Trialeurodes williamsi* Trehan, 1938.

According to Trehan, *F. williamsi* was first noticed by C. B. Williams in 1914 on ferns at the Royal Horticultural Society Gardens, Wisley, although the type series came from Kew Gardens in 1937. It is here removed from the genus *Trialeurodes* on account of the well developed tracheal pores and the broad shallow submarginal papillae. The following redescription is based on the holotype and three paratypes in the British Museum (Natural History).

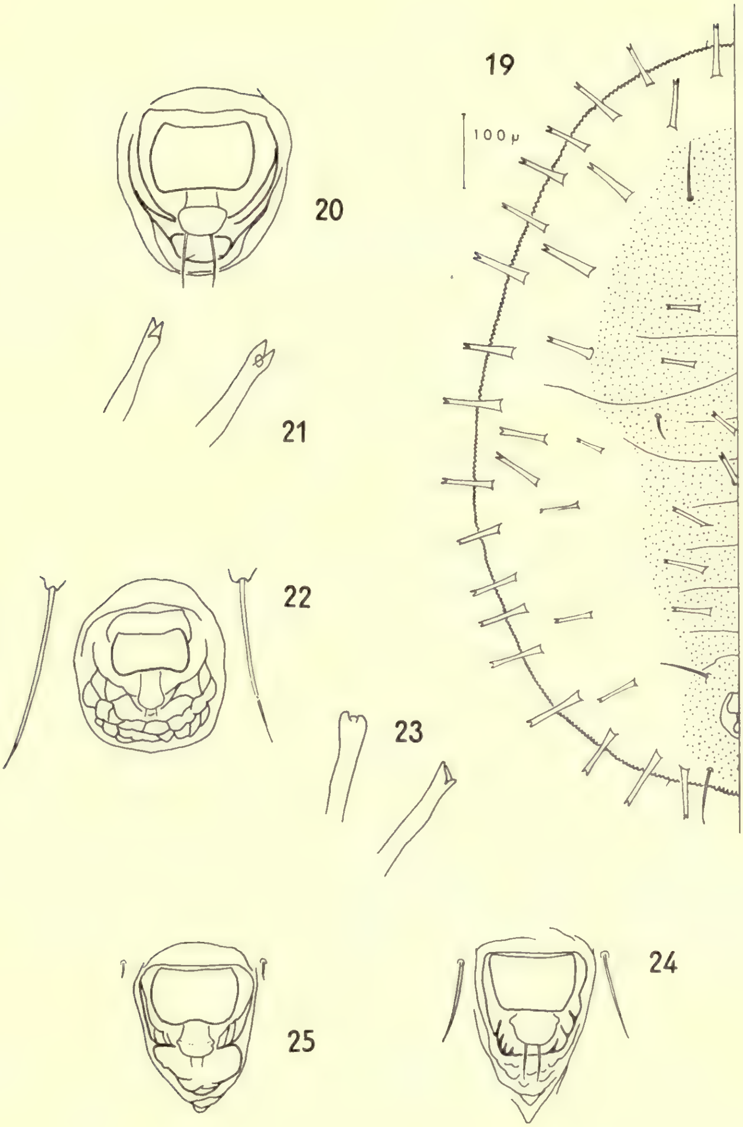
*Pupal case.* White or lightly shaded with brown. Elliptical, slightly emarginate at posterior. Margin with waxy palisade, also curved wax bands arising from submarginal papillae. Length 0·8 mm. Breadth 0·45 mm.

*Margin.* Smooth or smoothly crenulate, 20 crenulations in 100 μ. Anterior marginal setae 5 μ long, posterior marginal setae 13 μ long. Caudal setae submarginal in position, 8 μ long. Tracheal pore regions slightly emarginate, with four or five expanded crenulations.

*Dorsal surface.* Three pairs of small setae (8 μ), on cephalic region, first abdominal segment, and eighth abdominal segment lateral to base of operculum. Two paired rows of segmental pores, on rhachis and on subdorsum. Abdominal segment one with two pairs of pores near rhachis. Submargin with about thirty pairs of broad, shallow papillae (12–20 μ × 5–8 μ), with a pore mesad of each papilla. Transverse moulting suture not reaching margin, ends posterior to its mid-point. Second abdominal suture bends sharply to anterior, seventh abdominal segment almost occluded in mid-line due to anterior extension of segment eight. Subdorsal region without papillae, submedian depressions not very evident. Vasiform orifice with expanded anterior rim 10 μ long, lateral margins comparatively thick with about six internal teeth. Posterior border of orifice transverse, notched internally. Internal measurements, 47 μ long, 42 μ wide. Operculum more than half fills orifice exposing half of lingula tip. Lingula tip expanded with a single distal and three paired lateral lobes, terminal paired setae fine, barely extend beyond posterior border of orifice. Caudal furrow well developed, about 15 μ wide at anterior, tapering to 6 μ at posterior, slightly longer than internal length of orifice (50 μ).

*Ventral surface.* Anterior abdominal spiracles not apparent, posterior spiracles larger than thoracic. Ventral abdominal setae 10 μ long, 35 μ apart. One large (8 μ), and two or more small (3 μ) setae on a band of thickened cuticle around base of both legs on meso and metathorax.

Host plants (after Trehan, 1938). *Oleandra africana*, *Nephrodium confluens*, *Diplazium proliferum*, *Dryopteris flaccida*, *Anemia* sp.



FIGS. 19–25. 19. *Siphoninus immaculata*, dorsal surface. 20. *S. immaculata*, vasiform orifice. 21. *S. immaculata*, tips of dorsal tubes. 22. *S. phillyreae*, vasiform orifice. 23. *S. phillyreae*, tips of dorsal tubes. 24. *Pealius azaleae*, vasiform orifice. 25. *P. quercus*, vasiform orifice.

### ***PEALIUS*** Quaintance & Baker, 1914

Type-species, *Aleyrodes maskelli* Bemis, 1904.

The species included in this genus can be recognized from the dissected internal surface of the vasiform orifice, the exposed D-shaped tip of the lingula, the presence of a series of small or minute submarginal setae, and the reduction in length of abdominal segment seven. Two species are to be found in England, and they may be separated according to the following key.

Setae on cephalic subdorsum not reaching halfway to body margin; lingula tip wider than long; floor of vasiform orifice with postero-median area lacking sculpture **P. quercus** (p. 418)

Cephalic setae longer, often extend beyond body margin; lingula tip at least as long as wide; orifice floor much dissected by ridges . . . **P. azaleae** (p. 418)

### ***Pealius azaleae*** (Baker & Moles)

(Text-fig. 24)

*Aleyrodes azaleae* Baker & Moles, 1920.
*Pealius azaleae* (Baker & Moles) Takahashi, 1954.

The Azalea Whitefly is represented in the British Museum (Natural History) collection from Edinburgh; Ringwood, Hampshire, and Wisley, Surrey. At the latter site there has been a continuous population in existence out of doors for over thirty years, and in view of its success there, it is surprising that the species has not established itself elsewhere.

*Pupal case.* White, with a little wax round margin, elongate elliptical. Length 0·75–0·9 mm. Breadth 0·45–0·55 mm. Tracheal pore areas defined by several slightly thickened marginal crenulations. Anterior and posterior marginal setae present. Dorsum with three pairs of major setae, on cephalic region, and first and eighth abdominal segments, variable in length, 5 $\mu$ to 200 $\mu$. Minor setae on abdominal segments four to eight, close to margin, 4 $\mu$ long. Similar setae on cephalo-thoracic submargin, but due to minute size ($2\mu$), these are very difficult to count, apparently five pairs. Transverse moulting suture not reaching margin, second abdominal suture almost as long bending to anterior. Seventh abdominal segment less than half length of segment six. Vasiform orifice elongate cordate, internal surface much dissected, operculum rectangular, D-shaped lingula tip exposed.

Host plant. *Rhododendron mucronatum, R. simsii.*

### ***Pealius quercus*** (Signoret)

(Text-fig. 25)

*Aleurodes quercus* Signoret, 1868.
*Pealius quercus* (Signoret) Trehan, 1940.
*Aleyrodes avellanae*, Trehan, 1940 nec Signoret, 1868.

Trehan (1940) followed Douglas (1894) in considering a whitefly found on *Corylus avellana*, the adults of which were yellow with immaculate wings, as *A. avellanae* Signoret. However, Signoret states that the adults of *avellanae* have a black spot on the wing and the whole thorax blackish. From this it is evident that two species were being confused under one name. Fortunately Zahradnik has examined Signoret's type material (see under *Asterobemisia*) and established that Trehan was not correct in considering *avellanae* as a synonym of *quercus*.

*P. quercus* is widespread and locally abundant in England, and C. B. Williams (1964) has studied a population in Perthshire. The species apparently overwinters in the form of pupal cases on dead leaves lying on the ground, since adults are usually only to be seen during the early part of the summer.

*Pupal case.* White, with a vertical wax fringe. Broadly oval, slightly constricted at thoracic tracheal pore areas. Length 0·80–0·95 mm. Breadth 0·55–0·70 mm. Thoracic pore areas well defined by series of broad marginal crenulations. Anterior and posterior marginal setae present. Major dorsal setae very small, also caudal setae, less than 10 $\mu$ long. Submarginal setae 3 $\mu$ long, on abdominal segments four to eight, one pair only observed on cephalic submargin. Transverse moulting suture and second abdominal suture bend to anterior, not reaching margin. Submedian depressions not so well developed as in *azaleae*. Subdorsum with segmental papillae, often indistinct. Seventh abdominal segment less than half length of segment six. Anal apparatus much as in *azaleae* but lingula tip broader than long, orifice floor with median area lacking sculpture.

Host plants. *Quercus* spp., *Corylus avellana, Ostrya virginiana.* (*Carpinus, Fagus, Rubus*—Zahradnik, 1963.)

## ***SIPHONINUS*** Silvestri, 1915

Type-species, *Siphoninus finitimus* Silvestri, 1915.

This genus is characterized by the numerous short dorsal tubes, each with an open tip, which are found on the pupal case as well as the younger larvae. The adults are apparently distinctive in lacking a paronychium between the tarsal claws. Two species are recorded from Britain, and these may be separated according to the following key.

Dorsal tubes bifurcate at tip; submarginal setae minute, not reaching margin; sculpture of vasiform orifice floor with one large terminal areola **S. immaculata** (p. 420)
Dorsal tubes not bifurcate at tip; submarginal setae extend beyond margin; vasiform orifice floor divided into several large subterminal areolae **S. phillyreae** (p. 419)

### ***Siphoninus phillyreae*** Halliday, 1834

(Text-figs. 22–23)

The Phillyrea Whitefly is apparently widespread in Southern England, having been reported from Dorset, Surrey and Cambridge. Halliday described it from Dublin. It is found each year on Hawthorn around the British Museum (Natural History). Populations seem to persist in any given locality over long periods of time.

*Pupal case.* White, with median longitudinal brown stripe. Marginal wax palisade present, also some flocculent dorsal wax. Oval in shape, broadest across first abdominal segment. Length 0·8–1·0 mm. Breadth 0·55–0·70 mm.

*Margin.* Smooth, crenulations developed only at tracheal pore areas. Posterior marginal setae about 30 $\mu$ long, anterior marginal setae very close to mid-line, about 5 $\mu$ long.

*Dorsal surface.* Three pairs of major dorsal setae, 40 μ long, on cephalic region, and first and eighth abdominal segments. Eighth abdominal setae arise anterior to vasiform orifice. Minor dorsal setae, 20–40 μ long, in submargin of abdominal segments one, and four to eight, one pair on each segment ; also on metathorax, one pair ; mesothorax, two pairs ; prothorax, one pair ; cephalic region, four pairs. Dorsal tubes about 100 μ long, variable in total number 55 to 75, in three paired rows ; submarginally about 14 pairs, subdorsally about 14 pairs, medially about five pairs with a single tube on second abdominal segment. Apex of these tubes cup-shaped, not distinctly bifid. Transverse moulting suture almost reaches margin, second abdominal suture bends to anterior. Seventh abdominal segment two-thirds as long as segment six. Vasiform orifice rounded posteriorly, little longer than broad, 52 μ × 48 μ, posterior half of internal surface with two or more large areolae. Operculum occupies less than half of orifice, lingula tip little expanded, reaching to middle of orifice, without long terminal setae. Caudal furrow not developed, caudal setae submarginal in origin.

*Ventral surface.* Tracheal folds not developed, posterior abdominal spiracles larger than anterior pair. Ventral abdominal setae 25 μ long, 50 μ apart. Meso- and metathoracic legs each with one seta at base, 3 μ long. Antennae reach to first spiracle.

Host plants. *Phillyrea latifolia, Crataegus oxyacantha, Pyrus communis.*

## ***Siphoninus immaculata*** Heeger, 1855

(Text-figs. 19–21)

This species is apparently quite specific to Ivy (*Hedera helix*), on which it is widespread but infrequent throughout Southern England.

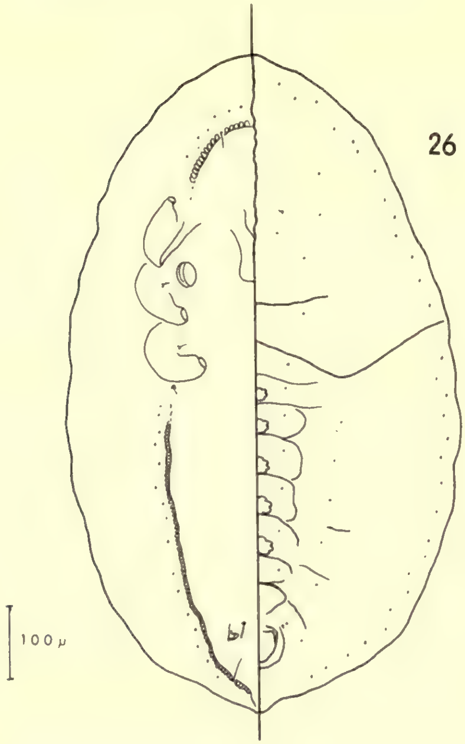
*Pupal case.* As in *phillyreae* except as follows ; without dorsal wax, minor dorsal setae very small, 3 μ, not reaching margin. Dorsal tubes clearly bifid at apex. Vasiform orifice longer than broad, 75 μ × 65 μ, with one large areola distally, operculum occupies half of orifice, lingula tip expanded with two long setae extending beyond margin of orifice.

## ***TETRALICIA*** Harrison, 1917

Type-species, *T. ericae* Harrison, 1917.

*Tetralicia* was based originally upon a description of adult whitefly collected on *Erica tetralix* at Waldridge Fell, Durham. The first definition of the genus is to be found in a key to the genera of Aleyrodidae by Baker & Moles (1923). The most important character is the way in which the dorsal surface of the pupal case is deflexed ventrally to meet the reduced ventral surface. In view of the close similarity between this genus and *Aleuropleurocelus* Drews & Sampson, 1956, the following details are given which may be of generic importance.

*Pupal case.* Elongate ovate. Dorsal surface larger than ventral, reflexed ventrally, true margin ventral in position, smoothly crenulate with pores. Anterior and posterior marginal setae present, rather long, about as long as caudal setae. Transverse moulting suture reaches apparent margin. Cephalic and eighth abdominal setae small or minute, first abdominal segment apparently lacks setae. Rhachis with median tubercles. Vasiform orifice subcordate, inner lateral margins ridged, operculum fills orifice, concealing lingula. Anterior abdominal spiracles smaller than posterior. Meso- and metathoracic legs each with one basal seta.



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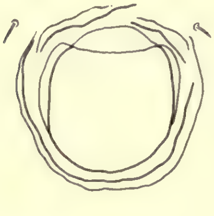

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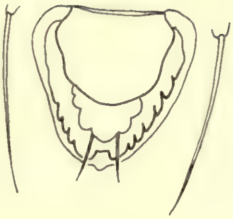

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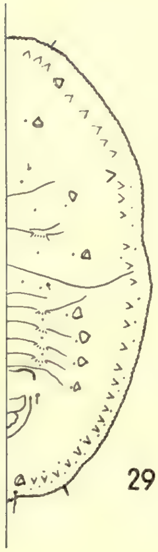

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FIGS. 26–29. 26. *Tetralicia ericae*, dorsal and ventral surfaces. 27. *T. ericae*, vasiform orifice. 28. *Trialeurodes vaporariorum*, vasiform orifice. 29. *T. vaporariorum*, dorsal surface.

### ***Tetralicia ericae*** Harrison, 1917

(Text-figs. 26–27)

In the original description of this species the larva was referred to as "transparent whitish", but Trehan has pointed out that this was probably based on a newly moulted specimen. The following redescription is based on black pupal cases, subsequently bleached, which were determined as belonging to this species by the original author in 1929, and deposited at the British Museum (Natural History) by E. E. Green. *T. ericae* has been found throughout England from Northumberland to the South Coast, but although locally common it is not frequent.

*Pupal case.* Black, margin with fringe of white wax. Elongate oval to elliptical, orientated along length of leaf, often concealed by curled leaf margins. Length 0·95–1·05 mm. Breadth 0·50–0·55 mm.

*Margin.* Deflexed ventrally except at caudal extremity, smooth, with well developed wax pores. Anterior and posterior marginal setae present, about 40 μ long. Caudal extremity rather protruding, bearing caudal setae, about 40 μ long. Tracheal pore areas not developed.

*Dorsal surface.* Setae apparently absent from first abdominal segment. Paired setae on cephalic region, and eighth abdominal segment anterior to orifice, 5 μ long. Longitudinal moulting suture reaches true margin, transverse moulting suture reaches apparent margin. Cephalic and prothoracic sutures poorly developed. First abdominal suture approaches transverse moulting suture, second suture bends to anterior in subdorsum. Remaining abdominal sutures not visible on subdorsum. Rhachis with well developed median tubercles on segments two to six. Segment seven three-fifths, segment six four-fifths of segment eight. Pores in four paired rows, on rhachis, subdorsally near rhachis, subdorsally near apparent margin, submarginally on ventral reflexed part of dorsal surface. Vasiform orifice broadly subcordate, margin broad, internal surface ridged, giving appearance of teeth laterally, internal measurements 52 μ × 52 μ. Operculum fills orifice, posterior border rectangular, conceals lingula (cf. Trehan, 1940, and Drews & Sampson, 1956, in which the figure is of a specimen damaged with caustic potash during bleaching, under which treatment the operculum often collapses laterally). Caudal ridges and furrow not developed.

*Ventral surface.* Anterior abdominal spiracles smaller than posterior. Ventral abdominal setae long, 40 μ, about 65 μ apart at base. Meso- and metathoracic legs each with one fine seta. 5 μ long, on small tubercle. One pair of small setae, 3 μ long, anterior to rostrum. Antennae reach base of prothoracic legs. Ventral adhesive organ heavily sclerotized.

Host plant. *Erica* species.

## ***TRIALEURODES*** Cockerell, 1902

Type-species, *Aleurodes pergandei* Quaintance, 1900.

As a result of the work of Russell (1948) on the North American species, the range of variation and the characters which should be studied in this group are well understood. Within any one species, the range of development of the submarginal and subdorsal papillae, which in life bear long wax filaments, is very great, and this variation is associated with the degree of hairiness of the host plant leaf. The appearance of the vasiform orifice and the trilobed lingula is quite distinctive of this genus and the related *Filicaleyrodes*.

## ***Trialeurodes vaporariorum*** (Westwood)

(Text-figs. 28–29)

*Aleurodes vaporariorum* Westwood, 1856.
*Asterochiton vaporariorum* (Westwood) Quaintance & Baker, 1914.
*Trialeurodes vaporariorum* (Westwood) Russell, 1948.
*Trialeurodes sonchi* (Kotinsky, 1907) [Syn. Russell, 1948].

Although the Greenhouse Whitefly was first described from this country, it was certainly introduced from some warmer climate. It can be found out of doors during the summer, but in winter it is probably restricted to glasshouses. The range of hosts is very large (Russell, 1963) and consequently so is the range of morphological variation (Hussey & Gurney, 1957).

In view of the detailed description given by Russell (1948), only the more important characters are given below. This redescription is based in part on a series of specimens loaned to the author from Westwood's Economic Collection at the Hope Department, Oxford, by courtesy of Professor Varley. The two leaves bearing pupal cases which are pinned in that collection, do not appear to belong to any of the plant species which Westwood named in his original description of the Greenhouse Whitefly. In view of this it has been decided not to designate a lectotype from this material. The specimens, however, are of considerable importance as they were collected before the introduction of the so-called American Race, the females of which produce males parthenogenetically, whereas the British Race produced only females (Schrader, 1926).

*Pupal case.* White, broadly oval, with vertical wax palisade, and numerous marginal wax filaments. Wax filaments sometimes lie horizontally, sometimes stand almost erect. Very lightly sclerotized, margin weakly crenulate. Tracheal pore areas usually indicated. Anterior and posterior marginal setae present, caudal setae submarginal in origin. Marginal papillae highly variable ; on specimens from smooth leaf, papillae almost equal in size ; on specimens from hairy leaf, several papillae frequently enlarged, such pupal cases also have several pairs of dorsal papillae. Submarginal pores closer to margin than submarginal papillae. Small dorsal setae on cephalic region, and first and eighth abdominal segments, the latter occasionally longer than the orifice. Seventh abdominal segment short but still visible in mid-line. Vasiform orifice subcordate, without anterior rim, notched at posterior. Operculum cordate, covering only proximal pair of lingula lobes. Meso- and metathoracic leg bases slightly sclerotized, each bearing one or more small setae. Anterior abdominal spiracles present.

## SYSTEMATIC LIST OF HOST PLANT GENERA OF BRITISH WHITEFLY

(excluding Greenhouse species)

| Families of Host Plants | Host Plant Genera | *A. proletella* | *A. fragariae* | *A. jelinekii* | *A. avellanae* | *B. tabaci* | *D. chittendeni* | *P. azaleae* | *P. quercus* | *S. phillyreae* | *S. immaculata* | *T. ericae* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RANUNCULACEAE | *Thalictrum* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| PAPAVERACEAE | *Chelidonium* | × | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| CRUCIFERAE | *Brassica* | × | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Cardamine* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| GUTTIFERAE | *Hypericum* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| LEGUMINOSAE | *Vicia* | × | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| ROSACEAE | | | | | | | | | | | | |
| Pomoidea | *Crataegus* | .. | .. | .. | .. | .. | .. | .. | .. | × | .. | .. |
| | *Pyrus* | .. | .. | .. | .. | .. | .. | .. | .. | × | .. | .. |
| Rosoidea | *Fragaria* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Geum* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Rubus* | .. | × | .. | × | .. | .. | .. | × | .. | .. | .. |
| | *Filipendula* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| ONAGRACEAE | *Chamaenerion* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| ARALIACEAE | *Hedera* | .. | .. | .. | .. | .. | .. | .. | .. | .. | × | .. |
| UMBELLIFERAE | *Aegopodium* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| CORYLACEAE | *Carpinus* | .. | .. | .. | × | .. | .. | .. | × | .. | .. | .. |
| | *Corylus* | .. | .. | .. | × | .. | .. | .. | × | .. | .. | .. |
| | *Ostrya* | .. | .. | .. | .. | .. | .. | .. | × | .. | .. | .. |
| FAGACEAE | *Fagus* | .. | .. | .. | .. | .. | .. | .. | × | .. | .. | .. |
| | *Quercus* | .. | .. | .. | .. | .. | .. | .. | × | .. | .. | .. |
| ERICACEAE | *Arbutus* | .. | .. | × | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Erica* | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | × |
| | *Rhododendron* | .. | .. | .. | .. | .. | × | × | .. | .. | .. | .. |
| OLEACEAE | *Phillyrea* | .. | .. | .. | .. | .. | .. | .. | .. | × | .. | .. |
| SCROPHULARIACEAE | *Melampyrum* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Veronica* | .. | .. | .. | .. | × | .. | .. | .. | .. | .. | .. |
| LABIATAE | *Nepeta* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Teucrium* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| CAMPANULACEAE | *Campanula* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| CAPRIFOLIACEAE | *Lonicera* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Symphoricarpos* | .. | × | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Viburnum* | .. | .. | × | .. | .. | .. | .. | .. | .. | .. | .. |
| COMPOSITAE | *Sonchus* | × | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |
| | *Cichorium* | × | .. | .. | .. | .. | .. | .. | .. | .. | .. | .. |

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# DIPTERA FROM NEPAL

## CONOPIDAE FROM NEPAL AND THE ORIENTAL REGION

S. CAMRAS

## HELEOMYZIDAE

J. C. DEEMING

## PIPUNCULIDAE (DORILAIDAE)

D. ELMO HARDY

## A NEW SPECIES OF RHINOPHORIDAE

B. HERTING

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NATURAL HIST

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*By* S. CAMRAS xvij.
4407, N. Milwaukee Avenue, Chicago, 30, Illinois

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British Museum (Natural History)

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Academy of Sciences, U.S.S.R., Moscow

*Pp.* 429–464 ; 29 *Text figures*

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# DIPTERA FROM NEPAL

## CONOPIDAE FROM NEPAL AND THE ORIENTAL REGION

*By* S. CAMRAS

### SYNOPSIS

Seventeen specimens from Nepal were received, representing six species, only one of which was previously known from Nepal. Two of the six species are new. Five additional Oriental records are presented, including a new species of *Microbrachyceraea*. A key is given for the genera related to *Microbrachyceraea*.

THIS report is based on specimens collected by the British Museum East Nepal Expedition of 1961–62. In addition other specimens in the British Museum (Natural History) and the Bishop Museum are recorded. These were received through the courtesy of R. L. Coe and J. L. Gressitt.

### A. RECORDS FROM NEPAL

### *Conops claripennis* Brunetti

Brunetti, 1923 : 345

E. NEPAL : Arun Valley ; Tumlingtar plateau, *c.* 2,000 ft, yellow blooms of cultivated composite (*Guizotia abyssinica* Cassini), 5 ♂, 1 ♀, 8–25.xii.1961 (*R. L. Coe*), B.M. (Nat. Hist.).

UNITED PROVINCES : Kotdwara, 1 ♀, 10.vi.24 (*T. Jermyn*), B.M. (Nat. Hist.).

These specimens are relatively large (9·5–10·5 mm.) and dark, and have a small area of blackish in the centre of the front. Otherwise known only from the type series from Quetta and Deesa.

### *Physocephala sinensis* Kröber

Kröber, 1934 : 15.

E. NEPAL : Taplejung Distr. ; Sangu, *c.* 6,200 ft, yellow blooms of cultivated composite (*Guizotia abyssinica* Cassini), 1 ♂, 2 ♀, 16–29.x.1961, mixed vegetation by stream in gully, 1 ♀, xi.1961–i.1962. Arun Valley ; Tumlingtar plateau, yellow blooms of cultivated composite (*Guizotia abyssinica* Cassini), 1 ♂, 1 ♀, 10–16.xii.1961 (*R. L. Coe*), B.M. (Nat. Hist.).

These specimens average too large and too dark to be referred to *calopa*, *tenella*, or *limbipennis*. In a previous paper (Camras, 1960 : 124) the frequent absence of the black on the apex of the wing was noted. At that time I was not aware that the main difference from *pusilla* is the absence of the wing pattern in the basal cells in *sinensis*.

This widely distributed species is here recorded for the first time outside of China.

Bull. Brit. Mus. (nat. Hist.), Ent. **17** (10) 1966.

### *Physocephala coei* sp. n.

♂. Length 7 mm. Front black. Vertex dark yellow, black anteriorly. Facial grooves and cheeks yellow. Black mark in middle of facial keel and grooves. Occiput black, posterior orbit white pollinose. Antenna mainly black, apex of second segment and most of third segment rufous. First segment three times as long as wide. Second segment three times length of first. Third segment half as long as second. Arista and process of its proximal segment relatively short. Proboscis entirely black, twice length of head.

Thorax entirely black, slight brownish tinge on humerus. Yellow pollinose on upper metathorax and upper margin of postnotum. Faintly white pollinose medial to the humerus and forming an indistinct pleural stripe. Coxae mainly black, partly white pollinose. Legs rufous, partly black on anterior femora. Posterior femur mainly black. Posterior tibia yellow on basal 3/5, black apically. Tarsi yellowish on proximal segments, black on apical segments. Claws black, pulvilli yellow. Wings greyish hyaline, brownish black pattern from costa to third vein, ending abruptly apically a little beyond the second vein. First posterior cell with pattern in most of basal half. Margin posterior to the vena spuria partly hyaline. Calypters white. Halteres yellow, dark brown at base of stem.

Abdomen black. Rufous narrowly at junction of first and second segments, and second and third segments. Yellow pollinose posterior margin on third, fourth, and fifth segments, narrower on dorsum. Sixth segment mainly yellow pollinose, rufous apically. Genitalia mainly black.

♀. Length 7 mm. Similar to the male. Front reddish black to dark rufous and less distinctly separated from the face. Spot on keel and facial grooves brownish and much smaller. Black on legs more extensive, so that posterior femur and posterior tarsus are almost entirely black.

Abdomen darker without rufous at junction of first and second segments. No pollinose margin on fifth segment. Apical segments white pollinose. Theca and genitalia entirely black. Theca relatively short and thick, as long as wide.

Holotype ♂. E. NEPAL: Arun Valley; Tumlingtar plateau, *c.* 2,000 ft, yellow blooms of cultivated composite (*Guizotia abyssinica* Cassini), 10–16.xii.1961 (*R. L. Coe*), B.M. (Nat. Hist.). Allotype ♀. Same data except 8–25.xii.1961.

This species differs from all the related species except *annulifera* by having the humerus brownish black. From *annulifera* it differs by having the antenna and abdomen mainly black and lacking the black triangular mark on a reddish yellow front.

### *Physocephala rufifrons* Camras

Camras, 1960: 121.

NEPAL: Jiri, 2,000 m., 1 ♂, 17.v.1962 (*G. Ebert* and *H. Falkner*), B.M. (Nat. Hist.)

This specimen agrees fairly well with the description of the unique type female from Szechwan, but has the face as well as the front dark rufous, leaving only the facial grooves yellow.

### *Physocephala bicolorata* Brunetti

Brunetti, 1925: 79.

NEPAL: Jiri, 2,000 m., 1 ♂, 15.v.1962 (*G. Ebert* and *H. Falkner*), B.M. (Nat. Hist.).

### *Thecophora nepalensis* sp. n.

♀. Length 4 mm. Black, and white pollinose. Yellow on face, cheeks, basal half of femora, narrow junction of femora and tibiae, and pulvilli. Front rufous on apical margin, and adjacent to the ocelli. Antenna partly rufous at junction of second and third segments. First segment slightly longer than wide. Third segment a little longer than second segment. Apical half of distal segment of proboscis dark yellow. Lower half of occiput blackish yellow.

Wings greyish hyaline. Veins dark brown to black. Practically no yellow at the base of wing. Calypters and halteres yellowish white. Abdomen with indistinct distal white pollinose margins on sides of second and third segments, becoming extremely narrow on sides of fourth segment. Theca relatively long and spoon-shaped. Basal 2/3 distinctly yellow. Apical third and sides with distinct black margin corresponding to the black serrated area on the posterior surface.

Holotype ♀. E. NEPAL : Taplejung Distr., above Sangu, *c.* 9,200 ft, damp evergreen oak forest, 2–26.xi.1961 (*R. L. Coe*), B.M. (Nat. Hist.).

This species is similar to *atra*, but differs by the distinctive theca which is larger and yellow on the basal two-thirds, sharply separated from the black margin. The almost complete absence of yellow at the base of the wing is apparently also an important specific character.

## B. OTHER ORIENTAL RECORDS

### *Microbrachyceraea intermedia* sp. n.

♀. Length 8 mm. Mainly black. Yellow on front, face, cheeks, basal half of antenna, basal half of tibiae, calypters, halteres, and narrow apical margin of second abdominal segment. Ocellar tubercle and mark above base of antennae shining black. Facial grooves, cheeks, and orbits white pollinose. Antenna partly rufous on second segment, black on apex and arista. Second antennal segment a little shorter than third. Third segment nearly as wide as long. Arista three-segmented, no process on the second segment. Proboscis as long as head.

Femora dark rufous at apex and base and on trochanters. Second abdominal segment rufous, darker dorsally at base. Wings brownish hyaline, with brown pattern between first and third veins, becoming paler in the posterior half of the submarginal cell.

Abdomen with white pollinose areas on sides of apex of second and third segments. Narrow dark yellow apical margins on fifth segment and dorsum of sixth segment. Apex of abdomen and theca brownish black. Theca triangular with thick bulging posterior serrated area.

Holotype ♀. N. W. THAILAND : Chiangmai, Fang, 500 m., 12–19.iv.1958 (*T. C. Maa*), Bishop Mus.

*M. pendleburyi* differs from this species in addition to being smaller (5 mm.), by having some black on the front, brownish black second abdominal segment, and no brown pattern in the wing.

This species is somewhat intermediate between *Microbrachyceraea pendleburyi* and *Neobrachyceraea obscuripennis*, but the genera may be separated as follows :

1 Ocelli present. Front above, twice width of eye . . . . ***BRACHYCERAEA***
– Ocelli absent. Front much less than twice width of eye . . . . . . 2
2 Second segment of arista with distinct lateral process (projection). Second antennal segment longer than third. Ocellar tubercle more or less depressed. Large species (10–18 mm.) . . . . . . . . ***NEOBRACHYCERAEA***
– Second segment of arista without process. Second antennal segment slightly shorter than third, which is relatively wide. Ocellar tubercle not depressed. Small species (5–8 mm.) . . . . . . . ***MICROBRACHYCERAEA***

### *Conops vesicularis* Linné

*Conops ?ornatus* Big.; Brunetti, 1927 : 306.

MALAYA : Selangor, Kuala Lumpur, 1 ♀, ex coll. Dept. Agric., B.M. (Nat. Hist.).

This represents a marked extension of range, as this common European species is otherwise known in Asia only from Siberia and Korea. I hope it is not an erroneously labelled specimen.

### *Physoconops microvalvus* Kröber

Kröber, 1930 : 71.

MALAYA : Matang, 1 ♂, June, 1900, B.M. (Nat. Hist.).

Previously known only from Java; but *Conops celebensis* may be the same.

At one time (Camras, 1960 : 117) I referred this species to the genus *Siniconops*, but I am not sure that this is correct, and am leaving it here for the present.

### *Physocephala fumosa* Camras

Camras, 1957b : 115.

JAVA : Buitenzorg, 1 ex. (abd. missing) (*F. Muir*), Bishop Mus.

S. MOLUCCAS : Amboina, 4 ♂, 4 ♀, ii.01 (*F. Muir*), Bishop Mus.

Previously known only from the type male from Ambon [=Amboina].

All of these specimens have the scutellum rufous or brown, and the postnotum is partly brown in some specimens. The female theca is somewhat prominent and is similar to that of *bipartita*.

### *Zodiomyia sumbaensis* Camras

Camras, 1957*a* : 163.

N.E. INDIA : Narendranagar, 3,000 ft, 1 ♀, 7.xi.1944 (*T. Jermyn*), B.M. (Nat. Hist.).

This is a remarkable extension of range. The species (and genus) was previously known only from the unique female type from Sumba Island, Lesser Sunda Islands.

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# DIPTERA FROM NEPAL

## HELEOMYZIDAE

*By* J. C. DEEMING

SYNOPSIS

One species of Heleomyzidae was taken on J. Tyson's Expedition to West Nepal in 1953. This species, *Suillia nigripes* Czerny, hitherto little known and recorded only from China, is here redescribed and recorded from Sikkim and Nepal. No Heleomyzidae were taken during the British Museum Expedition to East Nepal in 1961–62. A new species from Darjeeling is described here for convenience and related species are discussed.

### ***Suillia nigripes*** Czerny

(Text-figs. 1–4)

*Suillia nigripes* Czerny, 1932 : 28.

THIS species was described from a single ♂ in poor condition collected at Sze-Tschuan, Ta-tsein-lu, China, at the extreme eastern margin of the Himalayas. As Czerny's type was in such poor condition as to render a complete description impossible, the species is redescribed from both sexes from material in the British Museum (Natural History) from Nepal and Sikkim. This is the only species of *Suillia* R.-D. known to me that has spurs on both fore and hind basitarsi in the male.

♂. A rusty brown, heavily dusted species, with hyaline wings clouded on cross-veins, legs and antennae more or less infuscated, and abdomen predominantly black.

Head (Text-fig. 1) rather square ; frons broader than an eye ; parallel sided, anteriorly yellowish, and densely haired ; face and jowls yellowish, intensively golden yellow dusted ; jowls two-thirds as wide as the obliquely oval eye is high ; orbital plates, ocellar triangle and occiput thickly brownish grey dusted ; antennae fuscous, except ventrally at the base of the third segment ; arista practically bare ; clypeus prominent ; palpus somewhat infuscated ; all head bristles strong.

Thorax brownish grey dusted, with a blackish line extending from anterior margin to base of scutellum ; no dark spots at bases of dorsocentral bristles ; humerus darker, especially below ; the anterior of the two notopleurals the longer ; one sternopleural ; scutellum, devoid of setulae, rather pointed, lacking an apical tooth, paler medially, the apical bristles closer to one another than to the laterals ; halteres yellow, apically fuscous.

Legs rusty yellow, more or less infuscated, especially centrally on femora ; all femora ventrally with dense, long, fine hairs ; fore femur with a row of 8–10 long posterodorsal bristles ; mid femur less swollen than the fore or hind, with a row of 8 anterodorsal bristles, of which only the apical three are long, three long anteroventral bristles on the apical third and two long posteroventral bristles preapically ; hind femur with a row of 7–8 strong anterodorsal bristles, a row of 4 bristles close above this on the apical half and a row of three such bristles slightly below it; fore tibia with long, fine, erect hairs on ventral and posterior surfaces, the preapical dorsal bristle long ; mid tibia similarly haired, with two strong preapical dorsal bristles, of which the

Bull. Brit. Mus. (nat. Hist.), Ent. 17 (10) 1966.

anterior is more apical, three strong apical bristles, of which the central is the longest, and several short spurs interspersed between these bristles; hind tibia with fine, rather long hairs on all surfaces, but this not nearly as outstanding as on the other tibiae, the preapical dorsal bristle long; fore basitarsus (fig. 3) with long erect hairs on posterior surface, and an almost straight, black apical ventral spur; mid basitarsus similarly haired but lacking an apical spur; hind basitarsus (Text-fig. 4) short haired, with a short, black, recurved apical ventral spur; the apical segments of all tarsi fuscous.

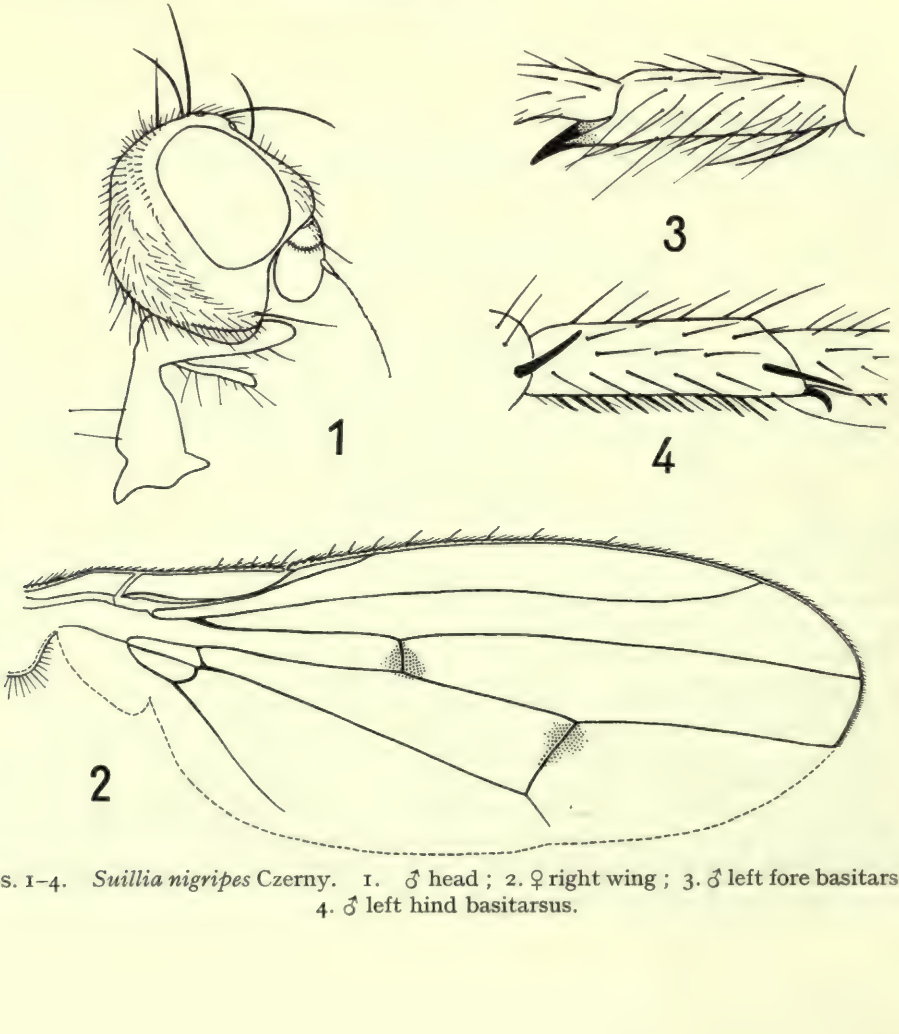
Wing (Text-fig. 2) yellowish hyaline with small dark clouds on the cross-veins.

Abdomen black, greyish dusted, with long bristles at sides of tergites only; sternites densely long haired; tergites 6 and 7 yellow; hypopygium and anal cerci long haired.

Length 6·5 mm.

♀. Resembling ♂, lacking the long hairs on femora and tibiae; having only one preapical dorsal bristle on mid tibia; no spurs on basitarsi; the sternites short haired; 7th abdominal segment slightly compressed laterally, dusted, not longer than the fifth.

SIKKIM, Gnatang, 12,000 ft, 31.iii.1924, 1 ♂ (*R. W. G. Hingston*). W. NEPAL: Baitadi, Tinkar Khola, 13,000 ft, 3.vii.1953, 1 ♀ (*J.B. Tyson*). Both specimens are in the British Museum (Natural History).



FIGS. 1–4. *Suillia nigripes* Czerny. 1. ♂ head; 2. ♀ right wing; 3. ♂ left fore basitarsus; 4. ♂ left hind basitarsus.

### *Suillia himalayensis* sp. n.

A reddish brown species closely resembling *S. stroblii* Czerny, but differing from it in having slightly longer aristal plumosity, the face fuscous, the cerebral hairs brown, the abdomen predominantly black, and in the male by having dense, long sinuate hairs on the sternites.

♂. Head higher than long; facial keel strong; antennae unicolorous with head, aristal plumosity slightly longer than depth of third antennal segment; frons narrowly darkened anteriorly; face and jowls anteriorly noticeably blackened, thinly white dusted; cerebral bristles brown.

Thorax reddish brown, heavily dusted, paler on the pleurae, infuscated only on lower margin of humerus and narrowly to base of wing; mesopleuron bare; scutellum rounded apically, devoid of setulae; halteres apically fuscous.

Legs yellow; mid-coxa with numerous short black blunt spines interspersed among the long bristles ventrally; fore femur with a row of 8–10 long anterodorsal bristles along its whole length, ventrally with long fine erect hair; mid femur with two long and some weaker bristles anteriorly on the apical half; ventrally with shorter, apically stronger hairs; hind femur with a curving row of 8 long anterodorsal bristles and a pair of bristles below this row, and long erect ventral hairs; all tibiae with dense decumbent ventral hairing, which is longest on the mid tibia; each tibia with one preapical dorsal bristle; mid tibia apically with one long ventral bristle, a short bristle on either side and some short spines interspersed between; fore basitarsus longer than the remainder of the tarsus, apically weakly produced into a blunt ventral projection; mid basitarsus with long posteroventral hairs; tarsi very slightly infuscated apically.

Wings yellowish hyaline, veins brown, as in *S. stroblii* Cz.; a strong well defined brown spot at apex of second vein; apices of third and fourth veins and posterior cross-vein clouded. Costa between mouths of 3rd and 5th veins pale yellowish white.

Abdomen black, dirty yellow on bases of first to third tergites, and on two lateral spots on fourth to sixth tergites; third tergite with strong apical bristles laterally; fourth to sixth tergites strongly bristled across their whole width; sternites with long dense sinuous hairs; genitalia very similar to that of *S. stroblii* Cz., paralobes semitriangular with dense long hair.

Length 7·5 mm.

♀. Resembling ♂, lacking long hairing on legs and abdomen, the fore basitarsal projection and the short spines on the mid coxa; fore femur with a row of weak posteroventral bristles; ovipositor slightly laterally compressed, as long as the previous segment, both these segments dirty yellow.

Holotype ♂, paratypes 4 ♂, 5 ♀, INDIA: Darjeeling, ix.1913 (*E. Brunetti*). Same data, 15.vi–15.vii.1916, 2 ♂, ♀. Same data, 13–18.ix.1913, ♀. (Two of the paratypes without heads). Types deposited in British Museum (Natural History).

There are two other species from "India" that closely resemble *S. stroblii* and *S. himalayensis*, but these are not described here due to lack of precise data accompanying the specimens. Whereas both *S. stroblii* and *himalayensis* have short blunt spines on the mid-coxa in the ♂, these species have not.

*S. stroblii* is known from Styria, Budapest and the Ussuri region of Eastern Russia. Specimens used for comparison were collected from lush herbage bordering a coniferous forest at Seis am Schlern, Western Dolomites during June 1964.

Gorodkov (1962) described (in Russian) five new species of *Suillia* R.-D. from Southern Russia. None of these species has the jowls as wide as *S. nigripes* Cz., or genital forceps of the same shape as *S. himalayensis*.

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# DIPTERA FROM NEPAL

## PIPUNCULIDAE (DORILAIDAE)[1]

*By* D. ELMO HARDY

SYNOPSIS

Only eleven specimens of Pipunculidae were collected by the British Museum (Natural History) expedition to East Nepal, 1961–62. These represent five species in two genera and two subgenera. One of the species may be named, but four appear to be undescribed.

No information is available on the species which occur in this region. Brunetti (1912, 1915 and 1923) described a number of species from northern India but had no records from Nepal. His descriptions are very inadequate and until his types can be restudied it will be impossible to deal with most of his species. It is of interest to note that one of the species, *Pipunculus distocruciator* n. sp., is known to be an important parasite of the rice leafhopper, *Nephotettix cincticeps*, in Japan. (Refer to Koizumi, 1959 : 42 and 1960 : 40—under " *cruciator* ".)

I am grateful to R. L. Coe and the British Museum (Natural History) for the privilege of studying this interesting material. I am appreciative of the cooperation I have received from Drs. K. Koizumi, A. Nagatomi, and K. Yasumatsu in lending me specimens from Japan for study. For the art work, I am indebted to Miss Noreen Naughton, University of Hawaii.

The two genera which are known from Nepal are readily differentiated by the presence of a stigma, or dark marking, in the subcostal cell in *Pipunculus* (Text-fig. 14), and by the lack of a stigma in *Tomosvaryella* (Text-fig. 20). The subgenus *Eudorylas* is differentiated from typical *Pipunculus* by lacking a fan of hairs on each propleuron.

### KEY TO KNOWN GENERA AND SPECIES OF PIPUNCULIDAE FROM NEPAL

1 Stigma present in third costal section (subcostal cell) (Text-fig. 11) . . . . 2
– Stigma lacking; wing venation as in Text-fig. 20 and male genitalia and hind trochanter of male as in Text-figs. 21 and 22 . ***Tomosvaryella nitens*** (Brunetti)?
2 Propleural fan present . . . . . . ***PIPUNCULUS (PIPUNCULUS)*** 3
– Propleural fan absent . . . . . . ***PIPUNCULUS (EUDORYLAS)*** 4
3 Male hypopygium with a prominent projection from the apex (Text-fig. 17). Femora predominantly black . . . . . . . . . . . ***exsertus*** sp. n.
– Hypopygium lacking such a development (Text-fig. 12). Femora yellow ***deminitens*** sp. n.
4 Third antennal segment acute (Text-fig. 1). Male hypopygium with an apical membranous area and with a membranous protrusion from the apex (Text-figs. 2 and 3) ***discors*** sp. n.
– Third antennal segment acuminate (Text-fig. 4). Male hypopygium with a prominent cleft extending longitudinally down the right side (Text-fig. 6) ***distocruciator*** sp. n.

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[1] Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Technical Paper no. 741.

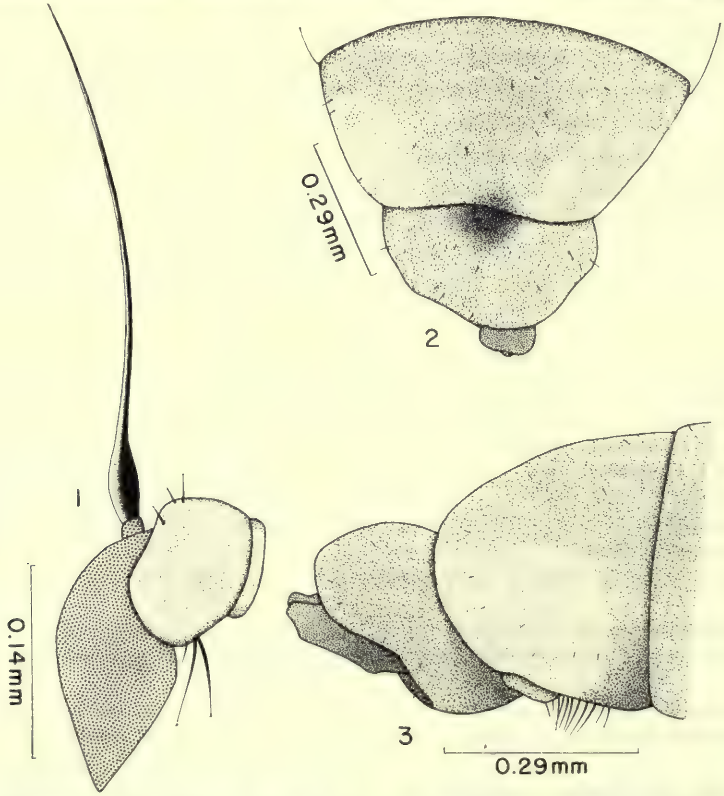
Bull. Brit. Mus. (nat. Hist.), Ent. **17** (10) 1966.

### ***Pipunculus* (*Eudorylas*) *discors* sp. n.**

(Text-figs. 1–3)

In Brunetti's key (1923 : 6) this would run to *P. campestris* var. *himalayensis* Brunetti. I have not seen specimens of Brunetti's " variety " but he said that the two specimens he had before him " varied so little from typical *P. campestris*, which is one of the commonest European species, having a wide distribution and therefore likely to occur in the Himalayas, that it seems impossible to regard them as other than a variety. The length of the arista being only twice instead of thrice the length of the antenna, the absence of any shiny black segment in the abdomen and the almost bare thorax are the only differences." Brunetti's reference is to *campestris* Verrall, 1901, *British Flies* **8** : 99–103, not *campestris* Latreille. Verrall's *campestris* is a synonym of *P. ater* Meigen. (Refer to Hardy, 1943 : 74.) *P. discors* is not related to *ater* ; the two belong in different subgenera. This does not appear to fit near any of the Palaearctic species treated by Sack (1935).

♂ *Head :* The eyes are joined on the front for a distance about equal to the length of the frontal triangle. The lower portion of the front is entirely silvery grey pubescent. The face is silvery grey, equal in width to the lower portion of the front. The antennae are brown to black,



FIGS. 1–3. *Pipunculus* (*Eudorylas*) *discors* sp. n. 1. antenna ; 2. ♂ genitalia, dorsal ; 3. ♂ genitalia, lateral.

the third segment is acute (Text-fig. 1). *Thorax :* Shining black in ground colour, brownish pollinose on the dorsum, grey on the sides. The humeri are brown to black, covered with grey pollen. The mesonotum is almost bare, with inconspicuous setae along the dorsocentral rows and along the sides. The scutellum has short, inconspicuous setae along the margin. The halteres are brown to black except for the yellow stems. *Legs :* Almost entirely brown to black, yellow on the extreme apices of the femora and tibiae, and broadly yellow on the bases of the tibiae. The tarsi are yellow, tinged with brown especially on the apical segments. The trochanters are yellow, tinged with brown, the hind pair is clear yellow ventrally. The hind tibia has no prominent erect setae on the outside surface. Moderately developed ventral spines are present on all of the femora. *Wings :* Subhyaline, with the brown stigma filling all of the third costal section. The third costal section is slightly longer than the fourth and the two sections combined are approximately equal in length to the fifth section. The *r-m* crossvein is situated near the basal third of cell 1st $M_2$ and the last section of vein $M_1 + {}_2$ is slightly curved. The last section of vein $M_{1+2}$ is about equal in length to the *m* cross-vein. *Abdomen :* Rather broad and short, rounded on the sides, about 1/3 longer than wide (including the hypopygium), the proportion of the length to the width is 94 to 66. The abdomen is predominantly brown pollinose, the sides are grey and the shining black ground colour shows through down the medium portion of the dorsum. The first tergum has two short, black bristles on each side. The hypopygium is approximately 3/4 as long as the fifth abdominal segment and the entire apical portion is covered by a large membranous area ; this is visible only from ventral or lateral views (Text-fig. 3). As seen from a dorsal view, a prominent protrusion is visible at the upper portion of the membranous area (Text-fig. 2). As seen from above, the eighth segment has a depressed area in the middle near the base. The seventh segment is not visible from a dorsal view. The ventral aspects of the genitalia have not been studied.

Length : Body, 2·75 mm. ; wings 3·5 mm.

♀ unknown.

Holotype ♂. E. NEPAL : Tumlingtar, bare, rocky slopes above R. Sabhaya, w. bank, *c.* 1,900 ft, 8–24.xii.1961 (*R. L. Coe*).

Type in the British Museum (Natural History).

### ***Pipunculus* (*Eudorylas*) *distocruciator* sp. n.**

(Text-figs. 4–7)

*Pipunculus* (*Eudorylas*) *cruciator* Koizumi, *nec* Perkins, 1959, *Sci. Reports Fac. Agric. Okayama Univ.* **13** : 41. **syn. n.**

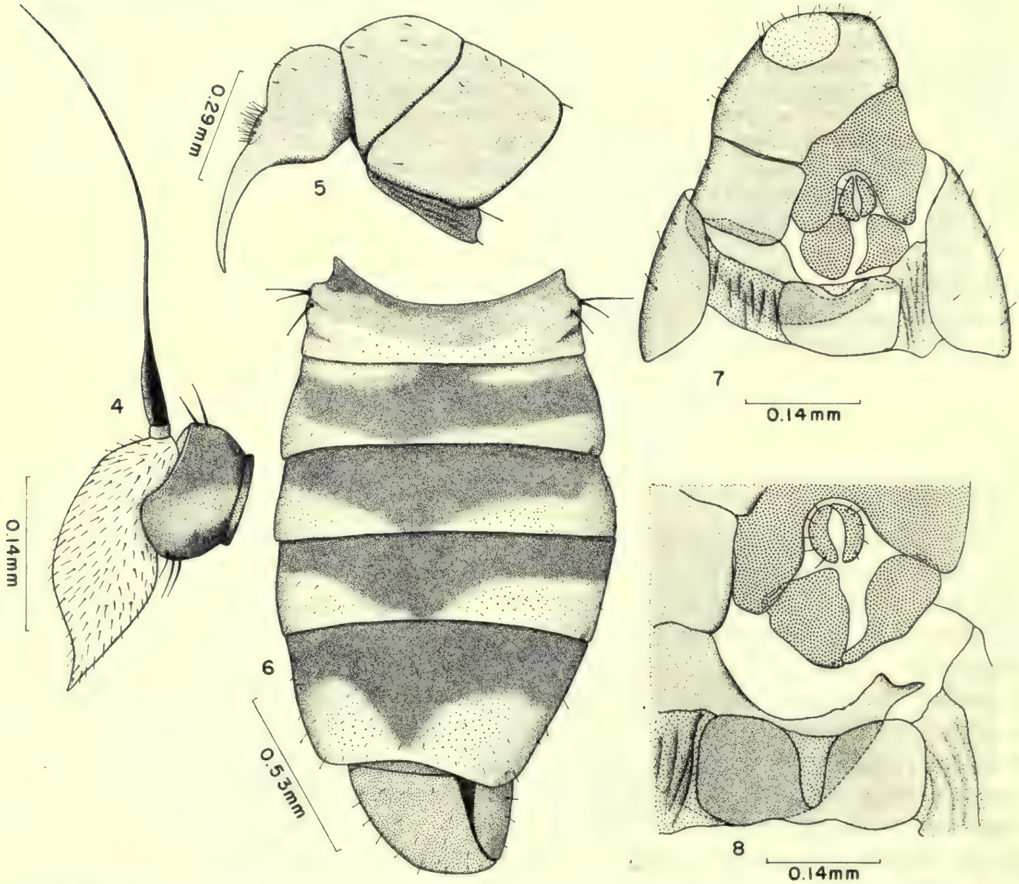
This species is closely related to *P. cruciator* and from external characters I see no way to differentiate the two. The ventral aspects of the male genitalia, however, appear to differ ; the shapes of the inner clasper and the fifth sternum show consistent differences in the specimens which I have studied from Australia (*cruciator*) and those from Japan and Nepal. I suspect that the record of " *cruciator* " from Koshun, Formosa, by Kertesz (1912 : 297) should pertain to *distocruciator*. *P. distocruciator* is differentiated from *cruciator* by having the inner clasper of the male short, broadly rounded (Text-fig. 7), rather than longer than wide, attenuated apically (Text-fig. 8). Also the fifth sternum (note, this was referred to as the sixth sternum by Hardy, 1964 : 99) is deeply cleft in *cruciator* (Text-fig. 8) and with but a shallow depression in the middle of the hind margin in *distocruciator* (Text-fig. 7).

♂. Fitting the description of *cruciator* Perkins except for the characters noted above (refer to the descriptions by Hardy, 1964 : 98). The excellent description and figures of Koizumi (1959 : 41) pertain to *distocruciator*.

The following notes deal only with the diagnostic characters.

*Head :* The antennae are short acuminate (Text-fig. 4). The third segment varies in colour from brown, tinged lightly with yellow to yellow with but a faint tinge of brown. *Thorax :* Shining black in ground colour, densely grey-brown pollinose over the dorsum, grey on the metanotum, pleura, and the anterior corners of the mesonotum. The humeri are yellow. *Legs :* The femora are black except for the yellow bases and apices. The legs are otherwise yellow except for the black coxae and brown to black apices of the tarsi. *Wings :* Hyaline except for the brown stigma which fills all of the third costal section. The third costal section is approximately equal in length to the fourth and the *r-m* cross-vein is situated near the basal third of cell 1st $M_2$. *Abdomen :* Rather broad, rounded on the sides, slightly over one-third longer than wide. Entirely opaque, brown at the bases of the terga, grey apically (Text-fig. 6). The prominent cleft extending longitudinally down the right side of the hypopygium is characteristic of the *cruciator* complex (Text-fig. 6). The distinguishing features of the genitalia have been noted above (refer to Text-figs. 7 and 8).

Length : body, 3·5–3·7 mm. ; wings, 4·75 mm.



Figs. 4–8. *Pipunculus* (*Eudorylas*) *distocruciator* sp. n. (4–7) and *P.* (*E.*) *cruciator* Perkins (8). 4. antenna ; 5. ♀ ovipositor ; 6. abdomen of ♂, dorsal ; 7. ♂ genitalia, ventral. 8. *P. cruciator*, ♂ genitalia, ventral.

♀. Fitting the description of the male except for secondary sexual characters, also the third antennal segment is clear yellow and slightly longer acuminate. The front is entirely grey pollinose. The grey marking on the sides and anterior margins of the terga are broadly interrupted with brown medianly. The ovipositor is shaped as in Text-fig. 5.

Length : approximately the same as for the male. One undersized specimen measures 2·5 mm. for the body and 3·5 mm. for the wings.

The characters of the puparium are the same as for *cruciator* (refer to Hardy, 1964 : 99).

Holotype ♂. E. NEPAL : Taplejung Distr., Sangu, *c*. 6,200 ft, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*). B.M.

Allotype ♀ and two paratypes, 1 ♂, 1 ♀, same data as type except that they were collected ix–x.1961. Also 1 ♀, same district and collector as type, between Sangu and Tamrang, *c*. 5,200 ft, mixed plants by damp cliff in deep river gorge, 22.xi.1961.

Type, allotype and two paratypes in the British Museum (Nat. Hist.). One paratype has been retained at the University of Hawaii.

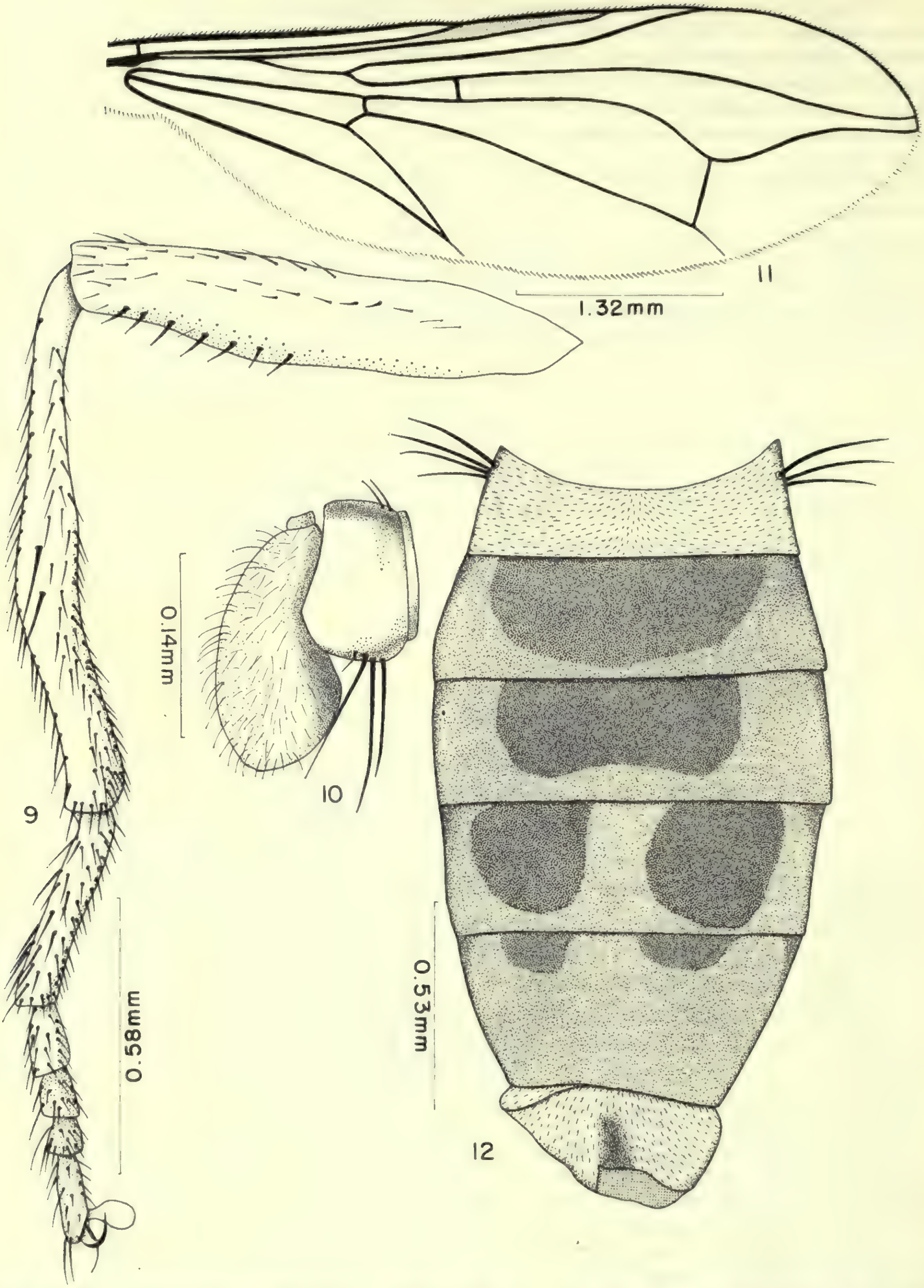
A series of specimens from Kyoto and Okayama, Japan, were borrowed from Kenji Koizumi through A. Nagatomi and K. Yasumatsu. This species is apparently common in rice fields in Japan and has been reared from the Green Rice Leafhopper, *Nephotettix cincticeps* Uhler (refer to Koizumi, 1959 : 42 and 1960 : 40). The specimens from Japan are not being indicated as paratypes.

## ***Pipunculus (Pipunculus) deminitens* sp. n.**

(Text-figs. 9–12)

This species runs near *P. nigronitens* Brunetti in Brunetti's key to the Indian species (1923 : 6) but his descriptions are so sketchy that many of the important diagnostic features are left out and it is probable that these two species are not actually related. Brunetti's type has not been re-examined, but based upon his original description *deminitens* would differ from *nigronitens* by having the humeri clear yellow, not brownish yellow ; by having the abdomen opaque black over the dorsum of terga two-four, rather than entirely shining black, except for the grey pollinose first tergum ; also the *r-m* cross-vein of *deminitens* is situated slightly before the basal fourth of cell 1st $M_2$, rather than just before the basal one-third as in *nigronitens* ; and the body measures 4·0 mm. rather than 3·0 mm. The resemblance of these two is probably superficial and since Brunetti gives no information on genital characters, it is not possible to compare the actual relationships.

♂. *Head :* The compound eyes are joined on the front for a distance about equal in length to the lower portion of the front. The lower front and the face are grey pubescent, the face is approximately equal in width to the front just above the antennae. The antennae are entirely black, the third segment is short, rounded at the apex (Text-fig. 10). The ventral setae of the second antennal segment extend well beyond the apex of the third segment. *Thorax :* Polished black in ground colour, except for the yellow humeri ; rather lightly brown pollinose over the dorsum, grey pollinose along the lateral margins of the mesonotum, and with a conspicuous silvery grey spot on each side of the front margin of the mesonotum just inside each humerus. The


11
1.32mm
9
0.58mm
10
0.14mm
12
0.53mm

Figs. 9–12. *Pipunculus* (*Pipunculus*) *deminitens* sp. n. 9. hind leg ; 10. antenna ; 11. wing ; 12. ♂ abdomen, dorsal.

mesonotum is bare except for short, inconspicuous setae down each dorsocentral row and for setae along the lateral margins. The scutellum has a row of short, rather inconspicuous setae around the hind margin. The pleura and the metanotum are grey pollinose. The stems of the halteres are yellow, the knobs are yellow, tinged with brown. *Legs :* Predominantly yellow, the coxae are black and the tarsi are tinged with brown to black on the apical segments. The trochanters are yellow, tinged with brown. The hind femur is rather slender, and has a row of prominent anteroventral setae extending over the apical half of the segment and a row of rather small anterodorsal setae extending almost the full length of the segment. The posteroventral surface of the hind femur has four black setae at about the apical fourth of the segment and a line of yellow hairs continuing to the base of the segment. Prominent black setae are present on the anteroventral and posteroventral surfaces of the middle tibia, these extend over the apical three-fifths of the segment on the anteroventral surface and over the apical three-fourths to four-fifths on the posteroventral surface. Moderately long, conspicuous cilia are present on the posterodorsal surface of the middle femur. The hind tibia is thickened medianly, attenuated at the base, and rather distinctly curved. Two prominent, erect anterior setae are present at the middle of the hind tibia (Text-fig. 9). The hind basitarsus is about equal in length to the next three tarsal segments. *Wings :* Entirely hyaline except for the grey-brown stigma. The third costal section is two times longer than the fourth and the two sections combined are slightly longer than the fifth costal section. The *r-m* cross-vein is situated near the basal fourth of cell 1st $M_2$ and the last section of vein $M_{1+2}$ is rather strongly curved (Text-fig. 11). *Abdomen :* The sides are gently rounded, the abdomen is broadest at the junction of segments three and four. The first tergum is entirely grey pollinose. Three to four prominent black bristles, plus several short setae are present in a row on each side of the first tergum. The abdomen is rather sparsely covered with short, brown to black setae and is polished black, except for velvety black markings on terga two-five. Terga two and three each have a large opaque black spot covering the anteromedian area, extending laterally over approximately two-thirds of the segment and posteriorly almost to the hind margin of the segment. Tergum four has a moderately large, opaque black spot on each side of the mid-line and tergum five has a rather small opaque black spot on each side (Text-fig. 12). As seen from direct dorsal view the hypopygium is approximately two-thirds as long as the fifth abdominal segment, compressed to the right and with a moderately large membranous area present at the apex of the eighth segment (Text-fig. 12). The ventral aspects have not been studied.

Length : Body, 4·0 mm. ; wings, 5·5 mm.

♀. Unknown.

Holotype ♂. E. NEPAL : Taplejung Distr., damp evergreen oak forest above Sangu, *c.* 10,400 ft, 2–26.xi.1961 (*R. L. Coe*).

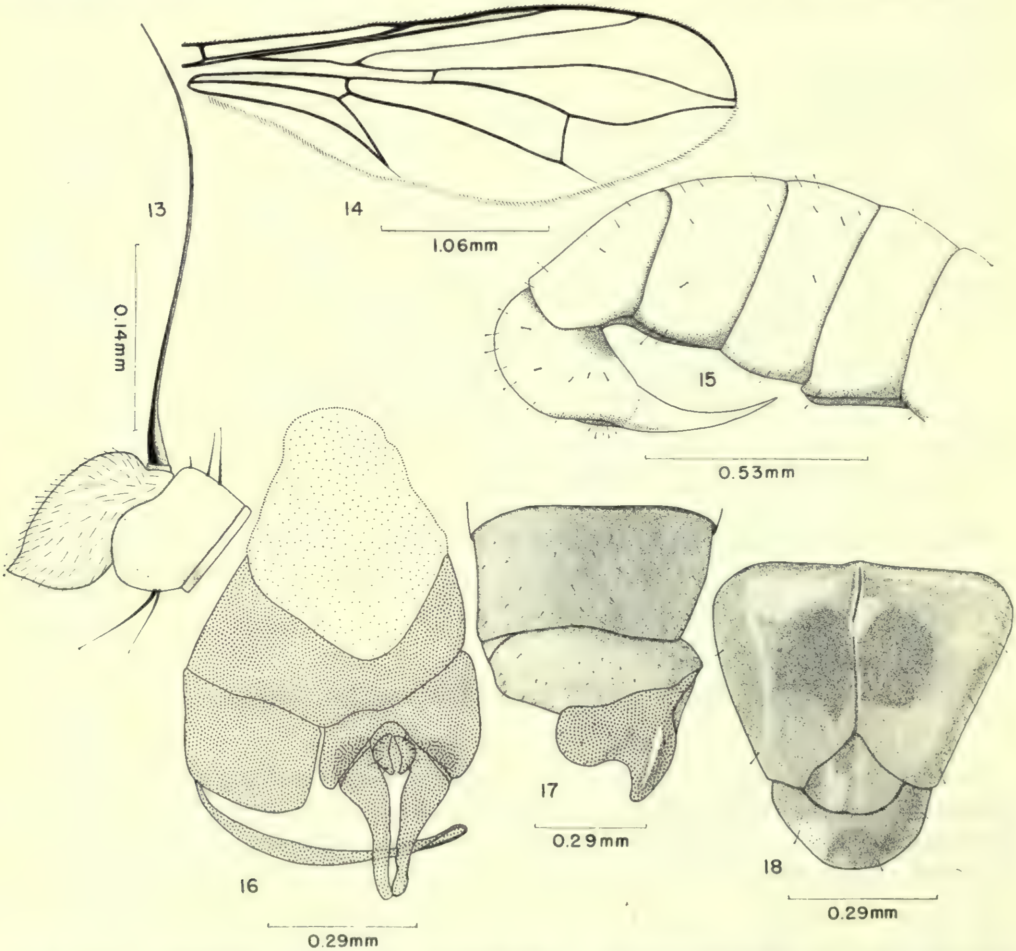
Type in the British Museum (Natural History).

## ***Pipunculus* (*Pipunculus*) *exsertus* sp. n.**

(Text-figs. 13–18)

In Brunetti's key (1923 : 6) this species runs near *transversus* Brunetti and *uniformis* Brunetti but both of these belong in the subgenus *Eudorylas* and *exsertus* is not related. The genitalia are strikingly different and the prominent extension of the membranous area will readily differentiate this species from any known from the Orient.

♂. *Head :* The head is approximately as high as long, the compound eyes are joined on the front for a distance approximately equal in length to the frontal triangle. The frontal triangle is dull black pubescent except for a small polished black spot in the median portion. The face is grey pollinose, at its narrowest point it is scarcely more than one-half as wide as the front above the antennae. The antennae are brown to black, covered with grey pubescence, the third segment is short acute (Text-fig. 13). *Thorax :* Shining black in ground colour, grey on the sides and grey-brown pollinose dorsally. The humeri are brown to black, tinged with yellow. The propleural fan is made up of several pale, inconspicuous hairs. The mesonotum is bare except for short setae down the dorsocentral rows and on the lateral margins. The scutellum has about eight short, pale setae around the hind margin. The halteres are yellow, except for the brown bases. *Legs :* The coxae are black, covered with grey pollen, the femora are dark brown to black, except for narrow yellow apices and bases. The trochanters are yellow, the tibiae are yellow, except for a tinge of brown medianly. The tarsi are yellow, except for the brown apical segments. Ventral spines are present on the middle and hind femora but these are not strongly developed. No prominent erect setae are present on the outside surface of the hind tibia. *Wings :* Entirely hyaline, except for the brown stigma. The stigma fills about the apical four-fifths of the third costal section. The third section is about one-third longer than the fourth and is just slightly longer than the fifth costal section. The *r-m* cross-vein is located at



FIGS. 13–18. *Pipunculus* (*Pipunculus*) *exsertus* sp. n. 13. antenna ; 14. wing ; 15. ♀ abdomen, lateral ; 16. ♂ genitalia, ventral ; 17. ♂ genitalia, dorsal ; 18. apex of ♀ abdomen, dorsal.

the basal third of cell 1st $M_2$ and the last section of vein $M_{1+2}$ is gently curved (Text-fig. 14). *Abdomen :* Rather narrow, almost straight-sided. The first four terga are opaque brown, the fifth is blue-black in ground colour, lightly grey-brown pollinose, opaque brown only on the anterolateral margins. The fifth segment is approximately one-half longer than the fourth. The sclerotized portion of the genitalia is shining black in ground colour, covered with grey-brown pollen ; the membranous portion is opaque brown. As seen from a dorsal view the hypopygium is distinctly longer than the fifth abdominal segment and the membranous portion is extended into a prominent projection as in Text-fig. 17. As seen from ventral view, the large membranous area covers the entire apex of the hypopygium. The claspers are long, slender and straight-sided, as in Text-fig. 16.

Length : Body, 2·8–3·0 mm. ; wings, 3·7–3·9 mm.

♀. Fitting the description of the male in most respects. The front is broad, entirely grey pollinose and four to five times wider than the narrowest portion of the face. The abdomen is straight-sided, the first two segments are entirely grey pollinose, the third and fourth terga are brown dorsally, grey on the sides and terga five and six are subshining black, lightly grey-brown pollinose. Terga three and four are yellow in ground colour on the lateral and ventral margins. The fifth abdominal segment is approximately one-third longer than the fourth and the sixth segment is one-fourth longer than the fifth. As seen from dorsal view the sixth segment is split in the middle of the posterior margin and a longitudinal groove extends the full length of the segment (Text-fig. 18). The ovipositor is short and curved, and extends approximately to the base of the fourth abdominal segment (Text-fig. 15).

Length : Body, 3·2 mm. ; wings, 4·0 mm.

Holotype ♂. E. NEPAL : Taplejung Distr., between Sangu and Tamrang, mixed plants by damp cliff in deep river gorge, *c.* 5,200 ft, 22.xi.1961 (*R. L. Coe*).

Allotype ♀ and one paratype ♂, same data as type, except collected in mixed shrubs in deep gorge, x–xi.1961.

Type and allotype in the British Museum (Natural History). Paratype in the collection of the University of Hawaii.

### ***Tomosvaryella nitens*** (Brunetti)?

(Text-figs. 19–22)

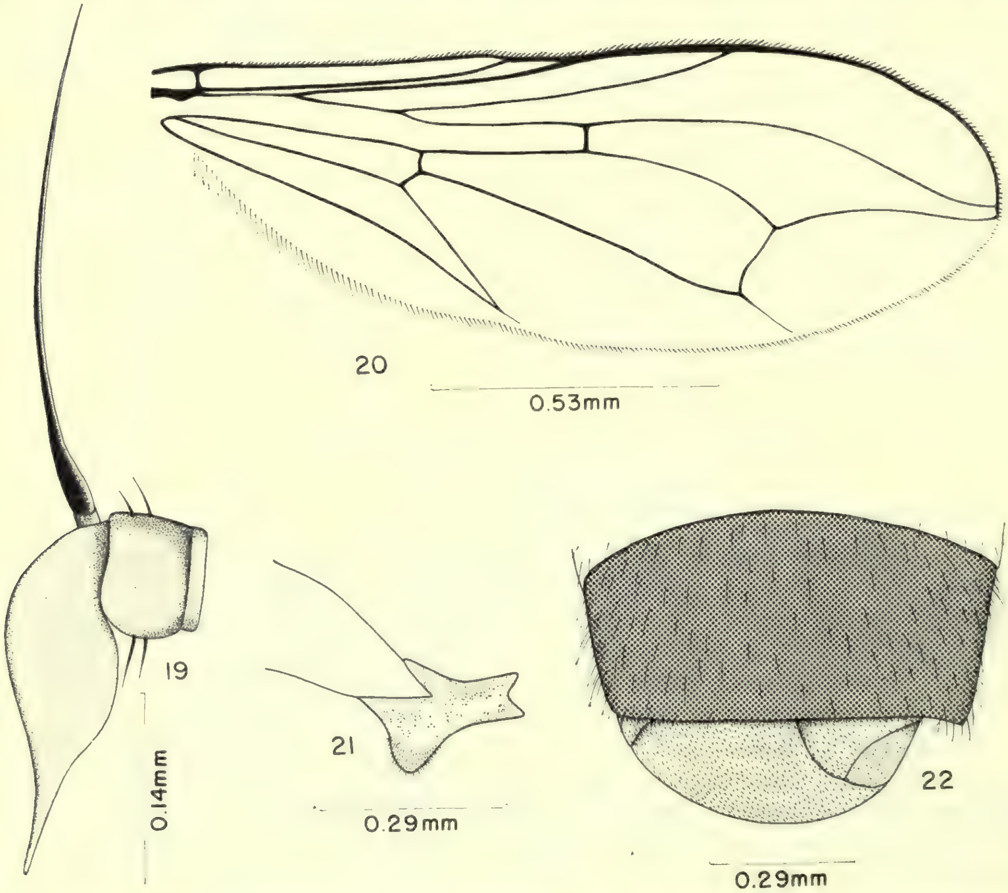
*Pipunculus nitens* Brunetti, 1912, *Rec. Indian Mus.* **7** : 492.

One ♂ specimen from E. NEPAL : Taplejung Distr., north of Sangu, dry grass above river bank, *c.* 5,000 ft, 5.i.1962 appears to belong to this species. From Brunetti's description of *nitens*, however, it is impossible to be sure of the identity of this species without studying the type. Also from the original description it would appear that *limpidipennis* Brunetti (1912 : 491) is the same as *nitens*. I see nothing in the original descriptions of these species which would differentiate them.

The species at hand is very close to *T. subvirescens* (Loew) and from external characters I see no way to differentiate these except by the shape of the development on the hind trochanter. In the specimen before me this is subacutely pointed (Text-fig. 21) rather than being flat topped as in *subvirescens*. It is possible that the specimen may be aberrant or that *nitens* may represent a subspecies of *subvirescens*.

A predominantly subshining blue-black species characterized by the symmetrical hypopygium (Text-fig. 22), and by the shape of the process on the hind trochanter (Text-fig. 21).

The compound eyes are joined on the front for a very short distance, approximately equal in length to four rows of eye facets. The upper portion of the front and the ocellar triangle are polished black, the lower front is silvery grey pubescent. The face is silvery grey pubescent, approximately equal in width to the lower portion of the front. The occiput is shining black, lightly brown pollinose on the upper portion, silvery grey on the lower two-thirds. The antenna is brown to black, the third segment is moderately acuminate (Text-fig. 19). The thorax is metallic black in ground colour, rather lightly brown pollinose on the dorsum, grey on the sides. The humeri are yellow. The halteres are yellow. The mesonotum is bare, except for a line of short, inconspicuous setae down each dorsocentral row, and for short, scattered setae on the anterior and posterior corners and also along the sides. The scutellum has a few short, inconspicuous hairs around the margin and scattered setae over the dorsum. The wings are entirely hyaline, the venation is typical of most *Tomosvaryella* (Text-fig. 20). The third costal section is just slightly more than half as long as the fourth and the *r-m* cross-vein is situated near the middle of cell 1st $M_2$. The legs are predominantly black, the broad bases and narrow apices of the tibiae are yellow. The first three to four tarsal segments are yellow, the apical segment is brown. The front and middle femora are polished black on their anterior surfaces, opaque



FIGS. 19–22. *Tomosvaryella nitens* (Brunetti). 19. antenna; 20. wing; 21. hind trochanter of ♂; 22. ♂ genitalia, dorsal.

grey posteriorly. The hind femur is opaque grey on the anterior and dorsal surfaces, polished black on the posterior and ventral surfaces. Short ventral spines are present on the front and middle femora, these are represented by one row each of anteroventral and posteroventral hairs on the hind femur. Each front femur has a short but prominent black posteroventral seta near the base of the segment. The process on the hind trochanter is densely grey pubescent and is shaped as in Text-fig. 21. The abdomen is metallic blue-black, lightly dusted with brown pollen and rather thickly covered with short brown setae. The first tergum has a row of about six black hairs on each side. The abdomen is almost straight-sided as seen from direct dorsal view. The hypopygium is symmetrical, with a prominent depressed area on the right side (Text-fig. 22). As seen from above the hypopygium is approximately one-half as long as the fifth abdominal segment. The ventral aspects have not been studied.

Length : Body, 2·8 mm. ; wings, 3·2 mm. ; Brunetti gave the length as 2·0 mm.

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# DIPTERA FROM NEPAL

## A NEW SPECIES OF RHINOPHORIDAE

*By* B. HERTING

### *Rhinomorinia longifacies* sp. n.

♂. Body and legs black. Pruinosity greyish, on the frons and thorax more brownish. Anterior 2/3 of the abdominal segments III–V covered with pruinosity, except for a broad mediodorsal vitta. Wings hyaline. Basicosta yellow. Halteres yellow. Calyptrae whitish.

*Head.* Frons as broad as 3/4 of one eye. Parafrontalia with two proclinate orbitals (the hind one short and hairlike) and one strong prevertical seta. Frontal vitta slightly narrower than a parafrontale. Face as long as the frons. Parafacialia as broad as 2/3 of the third antennal segment, with a row of small hairs. Third antennal segment one and a half times as long as the second. Arista pubescent, the hairs about as long as the basal width of the arista. Mouth border projecting, peristome about as long as the face, and as broad as 1/4 of the vertical diameter of the eye.

*Thorax* with 1 + 1 (0) *acr*, 2 + 3 *dc*, 0 + 2 *ia*. Prealar bristle short. Three humerals in a very triangular position, the inner one short and hairlike. Three sternopleurals. Pteropleural seta short and hairlike. Scutellum with strong cruciate apicals and strong laterals, the latter in an almost basal position. Mid tibia with one isolated anterodorsal bristle. Claws and pulvilli longer than the last tarsal segment.

*Wings* with a strong costal spine. $R_5$ opened on the tip of the wing. Bend of *m* rounded. Apical cross-vein weaker than the other veins, its distance from the wing margin equal to 2/3 of its length. Cross-vein *m-cu* straight, rather closer to *r-m* than to the bend of *m*.

*Abdomen* with two marginals on the third segment and a complete row on the fourth one. No discals, not even on the fifth segment. Lobes of the fifth sternite very big, one and a half times as long as the dorsum of the fifth tergite.

Holotype ♂, East Nepal: Taplejung distr., 5,500 ft, on mossy ground, 20.x.1961 (*R. L. Coe*). (Brit. Mus. (Nat. Hist.).)

The characters by which this peculiar species differs from the European species, *Rhinomorinia sarcophagina* Schin. and *Rh. subrostrata* Vill. are given below.

1 Face as long as the frons. Parafacialia with a row of short hairs over their entire length. Lateral bristles of the scutellum in an almost basal position. Basicosta yellow. Wing venation: *m-cu* rather closer to *r-m* than to the bend of *m*. Mid tibia with one anterodorsal bristle. Abdomen without discals. ♂: frons with proclinate orbital setae . . . . . . . . ***longifacies***

– Face shorter than the frons. Parafacialia bare, except for some small hairs in the upper part. Lateral bristles of the scutellum in normal position. Basicosta black. Cross-vein *m-cu* more than twice as far from *r-m* than from the bend of *m*. Mid tibia with several anterodorsal bristles. Abdomen with discals on the fourth tergite. ♂: frons without proclinate orbital setae ***sarcophagina*** and ***subrostrata***

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Bull. Brit. Mus. (nat. Hist.), Ent. **17** (10) 1966.

# DIPTERA FROM NEPAL

## NEW SPECIES OF *PLATYPEZA* AND *CALLOMYIA* (Family PLATYPEZIDAE)

*By* E. L. KESSEL

SYNOPSIS

Two new species of Platypezidae, *Platypeza nepalensis* and *Callomyia coei*, are described from the material collected by Mr. R. L. Coe in East Nepal.

THE collection of Diptera made by Mr. R. L. Coe on the British Museum (Natural History) Expedition to East Nepal, 1961–62 contained two examples of the family Platypezidae. Both represented undescribed species, one in the genus *Platypeza* and the other in *Callomyia*. I am grateful to Mr. J. P. Doncaster, Keeper of Entomology, and to Mr. Coe for the opportunity to study these specimens.

### *Platypeza nepalensis* sp. n.

♀. *General Appearance :* Head grey with brick coloured eyes, thorax and abdomen bluish grey marked with black ; wings clear ; legs yellowish brown.

*Head :* Face and front bluish grey ; proboscis and palpi yellowish brown ; occiput bluish grey ; bristles black except those on the proboscis which are yellowish ; antennae brown ; antennal segments short, the first two subequal, the third a little shorter than the first and second together ; first antennal segment as long as broad ; second segment a little shorter than broad ; third segment gently rounded at tip where arista is attached ; arista about twice the width of the three basal antennal segments taken together ; two minute rounded segments evident at base of arista ; first antennal segment without evident bristles, second segment with a ring of subequal bristles extending beyond the distal margin of the segment, third segment with short fine hair, and arista bare. Eyes brick coloured, widely separated, all facets of uniform size ; ocelli amber coloured ; ocellar tubercle bluish grey. Chief cephalic bristles : 5 pairs of subequal ocellar bristles, slightly divergent and directed forward ; frons with about 15 minute bristles on each side ; no verticals ; 2 postverticals on left side, one on right ; postverticals subequal to and adjacent to the long row of postorbitals on each side behind the eyes ; postverticals and postorbitals about twice the length of the ocellars ; numerous small occipital bristles below the postverticals and the postorbitals.

*Thorax* bluish grey, with posteriorly directed, black, tridentate marking on its dorsal surface. The base of this marking originates from a pair of black vittae in the neck region and which are in line with the posterior ocelli ; it widens out in front of the transverse suture, contracts, and widens again behind the suture to form the tridentate portion. The middle prong of the marking is wider and longer than the lateral prongs, reaching all the way to the scutellum and beyond, whereas the lateral prongs fall short of the scutellum. As it enters the scutellum, the middle prong widens out abruptly to become arrowhead-shaped and penetrates the scutellum for half its length. The two anteriorly directed grey processes which separate the three black ones are relatively short and fail by more than half their length to reach the transverse suture. All

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thoracic bristles black ; no acrostichals ; some 45 small pluriserial dorsocentrals on each side ; the posteriormost of these stouter and longer and the last bristle on each side very much stouter and longer ; the dorsocentrals on each side fan out in front to join about 9 posthumerals, all subequal to the dorsocentrals ; on each side there are 5 subequal humerals, 4 prominent notopleurals, and 4 postalars, with the middle two of the last prominent ; scutellum bare except for 4 prominent, convergent, marginal scutellars on each side.

*Wings* hyaline ; anal cell very long, about one-third its length removed from the wing margin ; posterior cross-vein about one-half its length removed from the wing margin ; fourth longitudinal vein branching nearer the wing margin than to the posterior posterior cross-vein ; posterior branch of the fourth vein clearly short of the wing margin. Halteres brownish.

*Legs* blackish brown ; posterior tarsi greatly flattened and with a prominent sole on the third and fourth tarsal segments which are the longest ; a prominent yellow bristle projects from the distal margin of segment 1 and of segment 2.

*Abdomen* yellowish grey below ; above bluish grey except for black markings as follows : segment 1 all bluish grey except for a longitudinal, black, dividing strip down the middle ; segment 2 all black ; segment 3 with a narrow black band along the anterior margin, widening in the middle fifth and behind to reach the posterior margin of the segment ; segment 4 with a narrow black band along the anterior margin and a thin edging of black along its posterior margin ; segment 5 similar to 4 but with the black band in front more prominent ; segment 6 all black except for a thin bluish grey margin behind.

Length : Body, 3 mm.

Holotype ♀. E. Nepal : Taplejung District, Sangu, about 6,200 ft, mixed vegetation by stream in gully, xi.1961–i.1962 (*R. L. Coe*).

*Platypeza nepalensis* is closely allied to the Nearctic *P. polypori* Willard, 1914, and the Palearctic *P. infumata* Haliday, 1838. The three species are distinguishable on the basis of their black thoracic and abdominal markings. For example, in *P. nepalensis* abdominal segment 1 is all bluish grey except for a prominent black dividing stripe down the middle, in *P. infumata* it is all bluish grey except for a wide black area in front and a thin black band along the posterior margin of the segment, and in *P. polypori* this segment is all bluish grey except for a thin black band along its posterior margin. Also useful for a quick separation of these three species are the differences pertaining to the middle and widest prong of the posteriorly directed tridentate black marking on the thorax. In *P. nepalensis* this middle prong not only reaches the scutellum, but extends well into it to form the arrowhead-shaped process described above ; in *P. polypori* this process about reaches the scutellum but does not extend into it ; in *P. infumata* the process ends far short of the scutellum.

## ***Callomyia coei* sp. n.**

♀. *General Appearance :* Head grey ; thorax black and grey ; abdomen banded with orange and black ; wings clear ; legs yellowish.

*Head :* Face and front silvery grey ; proboscis and palpi orange-yellow ; occiput black, heavily mottled with grey ; all bristles black except those on the proboscis which are yellowish brown. All segments of antennae brownish black ; first two segments short, as broad as long, subequal in length but first segment thinner ; first segment with a single dorsal bristle ; second segment with a ring of several prominent bristles ; third segment somewhat flattened, about as long as the first two combined, pointed at the apex, covered with short fine hair ; arista black, bare, terminal, its base consisting of two tiny bead-like segments. Eyes brick coloured, mottled with black, widely separated, all facets of uniform size ; ocelli amber coloured ; ocellar tubercle black. Chief cephalic bristles : one pair of prominent and divergent greater ocellars arising at the level of the anterior margin of the lateral ocelli ; a single pair of divergent lesser ocellars about one-fourth the length of the greater ocellars and arising at the level of the posterior margin of the lateral ocelli ; one pair of prominent divergent vertical bristles about equal in size to the greater ocellars, located at about the level of the lateral ocelli ; one pair of occipitocentrals, convergent, a little shorter than the verticals, located very slightly toward the midline but well behind ; one pair of slightly convergent occipitolaterals behind and lateral to the verticals, and in line with and at the sides of the occipitocentrals, a little shorter than the occipitocentrals ; the first postorbital on each side standing close to its occipitolateral, the postorbitals continuing the row begun by the occipitocentral and occipitolateral of the side, the members of the row not becoming thinner but getting shorter as they continue down the paracephalic regions to the cheek; in the lower region of the head two or three rows of prominent paracephalics, located behind and more or less parallel to the postorbitals, are continuous below with the beard of the cheeks and the parafacial regions ; one pair of prominent fronto-orbitals, about two-thirds the length of the vertical bristles behind them ; a single pair of minute frontals below and toward the mid-line from the verticals.

*Thorax* silvery grey, with a broad black stripe down the middle to the posterior margin of the scutellum. There is also a black area on each side of the mesonotum just above the wing base. Humeri brownish yellow ; squamae brownish cream, fringed with brown hairs ; all bristles black ; one row of 7 acrostichals set close together and extending down the midline, the row abbreviated somewhat in front and stopping behind about half-way back on the mesonotum ; a row of 13 dorsocentrals on each side, consisting of about 5 presutural and 8 postsutural bristles, the row curving outward in front at the level of the first acrostichal and extending uninterrupted to the humeral callus, and behind extending four bristles posterior to the last acrostichal, the posterior bristles of the row becoming much larger, and with the last one (prescutellar) very large ; 2 humerals in line with outward-turned dorsocentrals, about equal in size ; 2 additional presutural bristles, the posterior one much larger ; 3 postsutural bristles above the wings, becoming progressively longer from front to back ; 5 notopleurals, arranged 3 below toward the front and 2 above toward the back ; scutellum bare except for 2 pairs of prominent, convergent, marginal scutellars.

*Wings* clear ; with brownish veins ; no stigmata ; 12 spines on $R_1$ ; halteres brown.

*Legs* slender ; yellowish brown, with tarsi darker ; posterior tibiae and tarsi not much dilated.

*Abdomen* with segments 1, 2, and 4 silvery orange both above and below, and the fourth with a thin, brown, mid-dorsal, longitudinal stripe ; segment 3 black above and yellow below ; segment 5 black both above and below ; remaining segments yellowish ; dorsum and sides of abdomen clothed with slender black hairs which become distinct bristles on the terminal segments.

Length : Body, 3 mm.

Holotype ♀. E. NEPAL : Taplejung District, old mixed forest, above Sangu, about 6,200 ft, 25–28.x.1961 (*R. L. Coe*).

*Callomyia coei* is most likely to be confused with the Palearctic *C. amoena* Meigen, 1824, and the Nearctic *C. clara* Kessel, 1948. From the former it is quickly distinguishable by its black third abdominal segment, this being principally orange in that species. *Callomyia clara* also has orange on this third abdominal segment to set it apart. Moreover the all orange fourth abdominal segment of *C. coei* is replaced in *C. clara* by one which is marked by a black triangle lying over the orange. Also, the orange in *C. coei* is pale in contrast to the bright orange of *C. clara*.

# DIPTERA FROM NEPAL

## SARCOPHAGIDAE

*By* B. B. ROHDENDORF

### SYNOPSIS

The material studied comprises nine genera or subgenera and thirteen species, of which two genera, one subgenus and six species are described as new.

THIS paper is based upon material from Nepal sent to me by Mr. R. L. Coe for determination. The limited state of our knowledge about the Nepalese Sarcophagidae makes this collection of considerable interest and importance.

The material contains 13 species, 8 Sarcophaginae and 5 Miltogrammatinae. The Sarcophaginae are almost purely Oriental and contain only one new species. The Miltogrammatinae, on the other hand, all represent new and interesting forms. Although the collection is small, the number of new species is high, and this demonstrates the considerable originality of the East Nepalese fauna.

### Subfamily **SARCOPHAGINAE**

#### ***Parasarcophaga* (*Parasarcophaga*) *albiceps*** (Meigen)

EAST NEPAL: Arun valley below Tumlingtar, above R. Sabhaya, west and east shore, human excreta in sandy place, 9–12.xii.1961, 5 ♂, 4 ♀; ibidem, on sandy shore, 30.xii.1961, 1 ♀. Arun valley, Tumlingtar, dry sandy plateau, *c.* 2,000 ft, 12.xii.1961, 6 ♂. Taplejung Distr., Dobhan, *c.* 3,500 ft, on minute florets of tassel-flowered shrub, 23–31.i.1962, 1 ♀. Taplejung Distr., Dobhan, cut rice steppes above River Maewa, *c.* 4,000 ft, 28.i.1962, 2 ♂. Taplejung Distr., between Sangu and Tamrang, *c.* 5,500 ft, open ground by hill stream, 20–23.x.1961, 2 ♂, 1 ♀. Taplejung Distr., Sangu, *c.* 6,200 ft, mixed vegetation by stream in gully, ix–x.1961, 9 ♂, 2 ♀; ibidem, blooms of wild cherry, 15–18.xi.1961, 1 ♀; ibidem, yellow blooms of cultivated Compositae (*Guizotia abyssinica* Cassini), 16–29.x.1961, 2 ♂, 2 ♀; ibidem, bamboo plantation, 11.x.1961, 1 ♀. Taplejung Distr., above Sangu, edge of mixed forest, 17.x–1.xi.1961, 1 ♂.

#### ***Parasarcophaga* (*Parasarcophaga*) *knabi*** (Parker)

EAST NEPAL: Tumlingtar, bare rocky slopes above R. Sabhaya, west bank, 1,900 ft, 8–24.xii.1961, 1 ♀. Arun valley below Tumlingtar, R. Sabhaya, west shore, human excreta in sandy place, 9–22.xii.1961, 3 ♂, 4 ♀. Arun valley, Tumlingtar, dry sandy plateau, *c.* 2,000 ft, 12.xii.1961, 4 ♂. Arun valley above R. Sabhaya, east shore, human excreta in sandy place, 9–22.xii.1961, 3 ♂, 1 ♀; ibidem, yellow blooms of cultivated Compositae (*Guizotia abyssinica* Cassini), 10–16.xii.1961, 1 ♂. Taplejung Distr., Dobhan, *c.* 3,500 ft, on minute florets of tassel-flowered shrub, 23–31.i.1962, 1 ♀.

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### ***Parasarcophaga* (*Parasarcophaga*) *macroauriculata*** (Ho)

EAST NEPAL: Taplejung Distr., Sangu, 6,200 ft, yellow blooms of cultivated Compositae (*Guizotia abyssinica* Cassini), 16–29.x.1961, 1 ♂; ibidem, mixed vegetation by stream in gully, ix–x.1961, 1 ♂.

### ***Parasarcophaga* (*Parasarcophaga*) *orchidea*** (Böttcher)

EAST NEPAL: Arun valley above R. Sabhaya, east shore, human excreta in sandy place, 9–22.xii.1961, 2 ♂, 2 ♀. Arun valley, below Tumlingtar, R. Sabhaya, west shore, *c.* 1,800 ft, human excreta in sandy place, 9–22.xii.1961, 1 ♂, 3 ♀. Arun valley, Tumlingtar, dry sandy plateau, *c.* 2,000 ft, 12.xii.1961, 3 ♂.

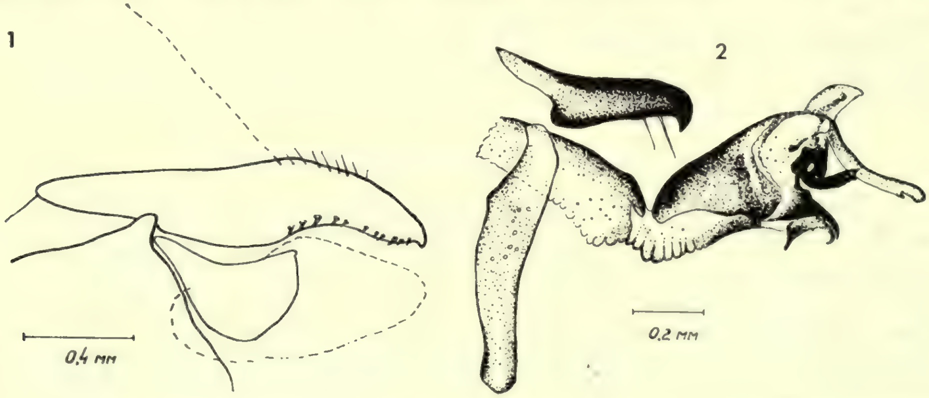
### ***Parasarcophaga* sp. indet.**

EAST NEPAL: Arun valley below Tumlingtar, R. Sabhaya, west shore, *c.* 1,800 ft, on sandy shore, 31.xii.1961, 1 ♀.

### ***Robineauella* (*Jantiella*) *coei* sp. n.**

(Text-figs. 1 and 2)

♂. Body-colour dark, as is usual in this genus. Frons above equal to 0·2 of head-width, at narrowest point to 0·13; the fly is somewhat immature so that the head is rather shrunken. frontal vitta black, narrow, at middle equal only to a half the width of a parafrontal, with fine and sparse black hairs. Parafacialia slender, with two irregular rows of fine, moderately long setae. Cheeks broad, almost equal to a quarter of the eye-height, with black hairs. Occiput with two or three rows of black setae behind the postorbitals and with pale hairs on the middle and lower parts. Anterior two-thirds of the parafrontalia and parafacialia golden yellow dusted. Antennae black; third segment 2·5 times as long as second, broad and parallel-sided. Arista with long fine hairs. Palpi black, long and moderately swollen at apices. Inner vertical setae long and strong, outer setae much shorter and finer. Thorax and adjacent parts dark in colour. *Acr* 0 + 0. *Dc* 4 + 4, only two *post* pairs strong, the others hair-like. Scutellum without lateral setae, with 1 strong basal, 1 strong subapical, 1 short subbasal and 1 fine, short, crossed



FIGS. 1–2. *Robineauella* (*Jantiella*) *coei* sp. n. (holotype). 1, Cerci and surstyli. 2, Phallosome and parameres.

apical pair of setae. $r_1$ bare, $r_{5+4}$ setulose on the basal section. Mid femur with a well-developed ctenidium. Mid and hind femur and tibia with very long dense hairs ventrally. Hind femur with a row of stout setae on anterior surface. Abdomen long and slender, without median marginal setae on the 3rd tergite; 4th tergite with one pair of setae in the middle of hind margin and three pairs of strong setae on the sides; 5th tergite with a complete marginal row of 18–20 setae. 2nd and 3rd sternites with very long dense hairs; 4th sternite with shorter but moderately dense hairs. Postabdomen black. Cerci in lateral view curved, with a short apical tooth, and on the anterior side with a row of very short but strong setae (about 10). Phallosome moderately sclerotized; apical part of paraphallus with a prominent median process and a pair of cylindrical, lateral appendices, which are incised anteriorly before apex. Ventral and membranal apophyses similar to those in *R. djakonovi* Rohd.

Length: 13·2 mm.

Holotype ♂. EAST NEPAL: Taplejung Distr., Sangu, *c.* 6,200 ft, mixed vegetation by stream in gully, ix–x.1961. Brit. Mus. (Nat. Hist.).

This species is most closely related to *Robineauella* (*Jantiella*) *djakonovi* Rohd., but differs from it by the curved cerci, which bear short but strong setae, and by the different structure of the apical part of the phallosome.

### ***Bercaea haemorrhoidalis*** (Fallén)

EAST NEPAL: Taplejung Distr., Dobhan, east bank of River Tamur, *c.* 3,000 ft, 1 ♂; ibidem, cut rice steppes above River Maewa, *c.* 4,000 ft, 22.i.1962, 3 ♂. Taplejung Distr., Sangu, *c.* 6,200 ft, mixed vegetation by stream in gully, ix–x.1961, 1 ♂, 1 ♀; ibidem, by rocky stream, 7–16.x.1961, 1 ♀.

### ***BOETTCHERISCA (COEISCA)* subgen. n.**

Type-species: *Sarcophaga khasiensis* Senior White, 1924.

This subgenus may be separated from *Boettcherisca* s. str. by the absence of the lamellate membraneous lobes, which are strongly sclerotized and furcate, by the very large, funnel-shaped styli, and by the large median conical protuberance on 5th abdominal sternite of male.

Based on a single species from the eastern Himalaya.

### ***Boettcherisca (Coeisca) khasiensis*** (Senior White)

(Text-fig. 3)

EAST NEPAL: Taplejung Distr., edge of mixed forest above Sangu, *c.* 6,500 ft, 17.x–1.xi.1961, 1 ♂.

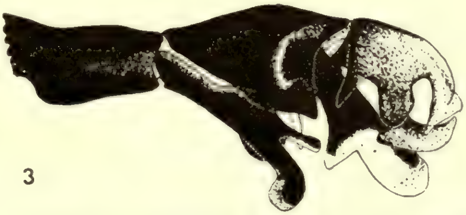


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FIG. 3. *Boettcherisca* (*Coeisca*) *khasiensis* S.W., Phallosome.

### ***Seniorwhitea orientaloides*** (Senior White)

EAST NEPAL: Arun valley below Tumlingtar, River Sabhaya, west shore, *c.* 1,800 ft., 9–12.xii.1961, 1 ♂. Taplejung Distr., Dobhan, cut rice steppes above River Maewa, 4,000 ft, 28.i.1962, 1 ♂.

## Subfamily **MILTOGRAMMATINAE**

### ***Miltogramma (Miltogramma) nepalicum* sp. n.**

♂. Frons above equal to 0·31 of the head-width, just above level of antennae to 0·30. Frontal vitta reddish brown, brownish black in front, the whole vitta matt and undusted; the vitta broad, the posterior (upper) part slightly widened; the ratio of the width of the anterior and posterior parts is 1 : 1·25. In lateral view the frons is moderately prominent. Frontal setae numerous but very fine, 22–25 pairs, partially crossed. Parafrontalia, parafacialia and face golden yellow, rather brightly dusted. The parafrontalia, besides frontal setae, and parafacialia with dense and fine black hairs. Orbital setae very fine, 4–5 pairs, almost indistinguishable and mixed with the frontal bristles. Ocellar setae short and curved laterad. Occiput golden grey. Postorbital setae fine and short, in two irregular rows. Antennae of moderate length, 3rd segment 1·9 as long as 2nd. Arista short, dilated almost to middle. Cheeks rather brightly golden yellow dusted, hind part more golden grey, 1/10 of the eye-height, with fine, pale dense hairs and isolated black setae in front. Facial ridges with fine black setae extending from vibrissal angle to the level of apex of 3rd antennal segment. Palpi yellow, with black bristles, of moderate size and with the apices swollen. Thorax dark in colour and densely yellowish grey dusted. Mesonotum with the usual longitudinal vittae: before the suture there are three slender median vittae and two lateral spots that are not sharply defined; behind the suture there is a rather indistinctly defined median vitta and short lateral vittae. *Acr* 0 + 1. *Dc* 2 + 4, only two *post* pairs long. Scutellum with strong basal, lateral and apical setae. Legs black. Setae on 4th segment of fore tarsus not dense: 4–5 sparse setulae present on anterior surface. Wings yellowish. Bend of *m* forming a right-angle. 3rd costal segment short, 0·3 of 2nd segment. Thoracic squamae pale yellow. Abdomen dark in colour and densely light golden brown dusted; the sides of 2nd, 3rd and 4th tergites slightly pale. 2nd tergite with a dark median dorsal spot; 3rd tergite with rather diffuse dorsal spots at sides and a very small, almost dot-like spot in the middle of hind margin; 4th tergite with two broad lateral vittae and an almost indistinguishable median spot; 5th tergite with three small, well defined spots on the hind margin. Ventral part of 3rd, 4th and 5th tergites with shining, well defined blackish brown spots. Postabdomen rather large; anal tergite shining black.

Length: 9·0 mm.

Holotype ♂. EAST NEPAL: Taplejung Distr., edge of mixed forest above Sangu, *c.* 6,500 ft, 17.x–1.xi.1961. Brit. Mus. (Nat. Hist.).

The species is very similar to *M.* (*M.*) *punctatum* Meigen, and differs from it by the densely yellow-dusted head, by the absence of median spots on 3rd and 4th tergites, and by the different form of the setae on the fore tarsus of the male.

### ***Senotainia (Sphixapata) nepalica* sp. n.**

♂. Head dark in colour, the frontal vitta matt black, undusted; dusting on head silvery grey, partially silvery white. Frons above equal to 0·293 of head-width, at narrowest point to 0·261. Frontal vitta narrow, posteriorly equal to only 0·5 the width of frons; the ratio of the width of anterior and posterior parts is 1 : 1·45. 8–9 pairs of frontal setae: posterior pair the shortest and weakest. 2 pairs of proclinate and 1 pair of strong reclinate orbital setae. Parafrontalia, apart from the strong setae, with 6–7 short but not particularly fine hairs. Ocellar setae of moderate size and curved forward and outwards. Vertical setae rather fine and short, the inner pair twice as long as the outer. Antennae black, the apical margin of 2nd segment reddish brown ; 3rd segment short, 1·55 as long as 2nd. Antennae falling short of epistoma by a distance equal to the length of 3rd antennal segment. Arista long : 2nd segment as long as broad ; the thickened part of 3rd segment equal to one-third of the slender part. Palpi short and slender, not dilated. Labellae of proboscis behind in the form of a pair of setulose horn-shaped processes. Parafacialia slender and rather prominent, 0·29 of eye length, with two irregular rows of setae. Cheeks one-fifth of eye-height, with rather dense black setae. Setae at vibrissal angle long and strong. Peristoma with long black setae. No further rows of occipital bristles present behind the postorbital row. Thorax dark in colour, with dense yellowish grey dust. Mesonotum with characteristic vittae : before the suture there are three subequal median vittae and two broad lateral spots ; behind the suture are three median vittae, the middle one of which is T-shaped and reaches the hind margin of mesonotum where it is rather broadened, the two lateral median vittae abbreviated and extending to a point just caudad of first *post dc* seta ; the lateral spots behind the suture broad and straight. *Acr* 1 + 3, only the *prst* and the posterior *post* pair strong. *Dc* 3 + 3, the two anterior *prst* pairs fine. Propleuron anteriorly with short and rather dense setulae ; humerus, centre of sternopleuron and upper part of mesopleuron also with short setae. Lateral parts of scutellum deep blackish brown, the median part pale grey dusted, with three strong marginal setae. Fore tibia with two posterior setae ; mid tibia with one anterodorsal and two posterior setae. Claws large, as long as 5th tarsal segment. The ratio of costal segments 2 to 6 is 47 : 19 : 77 : 26 : 4. The ratio of 2nd and 3rd segments of media is 13 : 47. Hind cross-vein longer than the last segment of $m_4$ (30 : 24), oblique and slightly sinuate. The ratio of the last segments of $m_4$ is 24 : 73. Abdomen with conspicuous and large black spots. 2nd tergite with three large spots, the median spot fused anteriorly with the lateral spots (beneath the scutellum) ; 3rd tergite with similar spots, but the median spot smaller and more sharply defined ; 4th tergite with slender and oblique lateral spots and with a very small, almost dot-like median spot ; 5th tergite without spots or vittae, but densely pale grey dusted like the whole of the lower surface of the abdomen. All borders of the tergites and sternites pale in colour. Abdomen egg-shaped, conical apicad. 2nd tergite on the sides with rather long setae, without setae in the middle of hind margin ; 3rd tergite with a complete row of setae on the hind margin, the lateral setae especially long and strong ; 4th and 5th tergites with similar setae on hind margins. Sternite 1 + 2 rather long-haired, especially posteriorly near the hind margin. Genitalia densely pale dusted, not particularly large.

Length : 6·1 mm.

Holotype ♂. EAST NEPAL : Taplejung Distr., Dobhan, cut rice steppes above River Maewa, *c.* 4,000 ft, 28.i.1962. Brit. Mus. (Nat. Hist.).

The species is similar to *S.* (*S.*) *albifrons* Rondani. It differs by the setulose propleuron, the slender and setulose parafacialia, the well-developed abdominal pattern, and the broader frons.

I am in doubt as to the correct systematic position of this species : several unusual characters, such as the setulose propleuron and the structure of the proboscis, are of especial importance and interest. This species may represent a distinct genus.

## *Senotainia* (*Sphixapata*) *himalayica* sp. n.

♂. Head dark, the dusting silvery grey. Frons above equal to 0·292 of the head-width, at narrowest point to 0·238. Frontal vitta pale brown, almost yellow, with yellowish dusting, not particularly broad : the ratio of the width of anterior and posterior parts is 1 : 1·83. 7 pairs of crossed frontal setae, the last pair weakest and level with the upper proclinate pair of orbitals. Parafrontalia almost bare, except for the strong setae, and only in front with sparse but not particularly short black hairs. Parafacialia with similar hairs. Ocellar triangle with one pair of long setae that are directed forwards and outwards; in addition to these bristles there are 2–3 shorter setulae on the posterior part of the triangle. Verticals not especially long, inner pair twice as long as outer. Apical margin of 2nd antennal segment reddish brown. Antennae of moderate size, 3rd segment 2·6 times as long as 2nd. Antennae falling short of epistoma by a distance slightly less than the length of 3rd segment. Arista straight and slender for two-thirds of its length, with short and sparse hairs; 2nd segment of arista much shorter than thick. Palpi not particularly short, the apices weakly dilated, with long black setulae. Frons prominent: in lateral view, parafacialia at level of antennal base 2·5 times shorter than length of an eye; cheeks one-fifth of eye-height, rather slender and with short black setae. Thorax dark in colour, densely grey dusted. Mesonotum in front with three median vittae and two lateral spots: the median vitta broader and darker than the other vittae; behind the suture with only a median vitta, which reaches the scutellum, and lateral spots, which only reach to level of *prsc dc*. *Acr* 2–3 + 2, only the posterior *post* pair strong, the others short and irregular. *Dc* 2 + 3, strong. The lateral parts of scutellum deep black in colour; scutellum with three marginal setae. Propleuron completely bare. Fore tibia with two posterior setae; mid tibia with one anterodorsal and two posterior setae. Claws long. The ratio of costal segments 2 to 6 is 35 : 12 : 55 : 17 : 3. The ratio of 2nd and 3rd segments of media is 14 : 34. Hind cross-vein oblique and almost straight, longer than the last segment of $m_4$, the ratio of these veins being 21 : 15. The ratio of both segments of $m_4$ (3 and 2) is 15 : 54. Abdomen dark in colour: only the borders of sclerites pale, yellowish. Almost all tergites with well developed black spots. 2nd tergite almost completely black; 3rd and 4th tergites each with a large broad median spot and poorly defined lateral spots; 5th tergite with three poorly defined spots. Ventral surface of abdomen without dark spots or pattern. Abdomen egg-shaped, blunt at apex. 2nd tergite with lateral setae but without setae in the middle of hind margin; 3rd tergite with a complete row of marginal setae, which are longest at the sides; 4th and 5th tergites with rows of similar setae, which are all long and strong. Sternites 1 + 2 and 3 with erect setae, each sternite on posterior part with a pair of long setae. Genitalia pale dusted, of moderate size.

♀. Frons and face narrower: frons above equal to 0·234 of head width, at narrowest point to 0·211. Body of paler colour: abdominal spots on 5th tergite almost absent. Otherwise as in the male.

Length: 4·0 mm. (♂♀), of wing 4·15 mm. (♂) and 3·75 mm. (♀).

Holotype ♂. EAST NEPAL: Taplejung Distr., Sangu, *c.* 6,200 ft, mixed vegetation by stream in gully, ix–x.1961. Brit. Mus. (Nat. Hist.).

Allotype ♀. Data as holotype.

This species differs from all known representatives of the subgenus by its small size, the well developed pattern on the abdomen, the bare propleuron, the long 3rd antennal segment, and by other characters.

## ***NEPALOMETOPIA* gen. n.**

Type-species: *Nepalometopia brunneipennis* sp. n.

This genus belongs to the tribe Metopiini and resembles *Metopia* Mg. most closely. However, it differs from the other genera of the Metopiini by the following characters:

Hind cross-vein situated almost midway between the angle of *m* and the cross-vein *r-m*. Frons short, not projecting. *Acr* setae absent. Parafacialia very slender, with a row of long setae. Vein $r_1$ bare. Cell $R_5$ open.

Based on a single species from the eastern Himalayas (Nepal).

## *Nepalometopia brunneipennis* sp. n.

♂. Head dark in colour. Parafacialia, parafrontalia, cheeks, face and occiput densely silvery grey dusted ; apical margin of 2nd antennal segment, anterior margin of frontal vitta and facial ridges reddish brown. Frons at the level of antennal base and of ocellar triangle equal to 0·35 of head-width. Frontal vitta broad, at lunula equal to one-third of width of frons, in the middle and near ocellar triangle broader. 7 pairs of frontal setae, all crossed but only two strong, the others fine. Two pairs of strong proclinate and three pairs of reclinate orbital setae. Vertical setae strong, the inner ones almost twice as long as the outer. Antennae long, 3rd segment 5 times as long as 2nd. Parafacialia narrow, at the antennal base equal to one-quarter of length of an eye, with a row of 9–10 setae of which the lower ones are strongest and the upper ones finest. Facial ridges with three setae above the strong vibrissal seta. Cheeks very slender, only 1/13 of eye height, with short sparse black hairs. Arista long and thin, with short and sparse hairs and dilated in basal quarter. Occiput strongly concave ; upper part of occiput with only a single supernumerary row of setulae behind the postorbitals. Ocellar setae fine but not particularly short. Postocellar setae short and fine, rather irregular. Mouth cavity broader than long. Proboscis short and thick ; palpi short and slender, scarcely swollen. Thorax dark in colour and grey dusted. Mesonotum before suture with one pair of narrow median vittae and one pair of broad lateral spot-shaped vittae. *Acr* almost absent, only one pair of very short fine *prsc* hairs present. *Dc* 2 + 3 long and strong. *Ia* 0 + 1. *Sa* 3, the middle one strong. *Npl* 2. *Stpl* 1 + 1. Scutellum with long basal and subapical setae, apicals short, and discals and laterals very fine. Legs dark in colour. Fore tibia with 1 short posterior seta ; mid tibia with 1 strong anterodorsal seta. Length of fore tarsus 1·15 mm., of fore tibia 0·85 mm. 1st segment of fore tarsus long, almost as long as the other tarsal segments combined : the ratio of segments 1 to 5 is 22 : 9 : 7 : 4 : 4. Tarsi without long hairs or setae. Wings brownish, all veins narrowly but distinctly bordered with brown. Wing without costal spine. 1st and base of 2nd segments of vein $r_{4+5}$ setulose. Costa with dense and short setulae as far as the last quarter of 5th segment (between the apices of $r_{2+3}$ and $r_{4+5}$) ; 6th costal segment without spines, bare. The ratio of costal segments 1 to 6 is 20 : 36 : 15 : 52 : 18 : 3. Hind cross-vein almost exactly midway between angle of *m* and *r–m* ; the ratio of 2nd and 3rd segments is 31 : 30. *R–m* (= *ta* or anterior cross-vein) concave. The angle of *m* forming almost a right-angle. Last segment of $m_4$ (" cu ") half as long as the preceding segment. Thoracic squamae white, yellowish on inner margin. The abdomen of the holotype is missing.

Length : Of wing, 3·95 mm.

Holotype ♂. EAST NEPAL : Taplejung Distr., Sangu, *c.* 6,200 ft, mixed vegetation by stream in gully, ix.x.1961. Brit. Mus. (Nat. Hist.).

## *NEPALISCA* gen. n.

Type-species : *Nepalisca dasyops* sp. n.

This genus belongs to the tribe Phyllotelini and is closely related to the genera *Medomyia* Rohd. and *Hoplacephala* Macq. It may be separated by the densely haired arista, the hairy eyes, and by the concentration of the wing-veins in the anterior half of wing (there is an extensive area without veins in the posterior part of wing).

Eyes densely haired. 3rd antennal segment twice as long as 2nd. Arista long-haired. Vibrissal angle placed far higher than usual, so that epistoma and face are very reduced ; vibrissal setae dense and strong. Epistoma not projecting forwards, peristoma rounded posteriorly ; frons prominent. Proboscis short but apparently functional. *Acr* 0 + 1, short. *Dc* 2 + 3

*Ia* (1) + 2, *prst* seta fine. *Sa* 2, strong. *Stpl* 3 + 1. Propleuron bare. Claws short, shorter than the last tarsal segment. Wing with cell $R_5$ open. 1st segment of $r_{4+5}$ setulose to middle. Abdomen short ovate, with long setae on the hind margins of 3rd, 4th and 5th tergites. Genitalia of moderate size.

Based on a single species from Nepal.

## *Nepalisca dasyops* sp. n.

♂. Frons at the level of ocellar triangle equal to 0·25 of the head-width, in front of the triangle to 0·21. Frontal vitta yellowish in the middle, narrow, narrowest at middle, and in front of ocellar triangle equal to only one-third of width of frons. The ratio of the width of anterior and posterior parts is 1 : 1. In lateral view the frons is prominent and equals half of eye length. Cheeks not especially broad, one-quarter of eye-height. Eyes very densely haired. 5–7 pairs of proclinate frontal setae, upper pairs shorter and only reaching to middle of frons. 3 strong proclinate and 2 reclinate pairs of orbital setae. Vertical setae strong, the inner ones almost twice as long as the outer. Ocellar setae fine and rather short. Apart from the setae parafrontalia and particularly parafacialia with dense short black hairs. Antennae black, of moderate size: 3rd segment twice as long as 2nd, narrowed and rounded apically. Arista dilated in basal fifth; 2nd aristal segment short; the whole arista with rather dense but not particularly long hairs. The antennae fall short of epistoma by a distance slightly less than length of 3rd antennal segment. Vibrissal angle and epistoma anteriorly shining black. Facial ridges bare. Cheeks with short black setae. Palpi black, of moderate size, cylindrical, scarcely dilated at apices. Thorax dark in colour, grey dusted. Mesonotum with 5 longitudinal vittae: the median vitta is slender, the lateral vittae broad. Behind the suture only the median vitta extends as far as scutellum, the other stop short some distance before the hind margin of mesonotum. The lateral corners of the scutellum and the dot-like spots at the bases of all the large setae on mesonotum are dark. Legs black. Wings subhyaline: *r–m*, $r_1$ in the middle, and *m* (= *tp* or hind cross-vein) faintly blackish. The ratio of costal segments 2 to 6 is 28 : 10 : 39 : 19 : 2. Costal spine short. 3rd segment of *m* shorter than 2nd: their ratio is 16·5 : 20; 3rd segment of *m* shorter than the distance between wing-margin and angle of *m* (their ratio is 16·5 : 22). Cross-vein *r–m* (or apical part of *m* or *ta*) long (32) and rather strongly sinuate. Apical segment of $m_4$ more than half the length of the preceding segment (24 : 41). Abdomen dark in colour, densely grey dusted. 2nd tergite black in the middle, at the sides of dorsal surface with small rounded spots; 3rd tergite with poorly defined paired spots in the middle and well-defined lateral spots; 4th tergite similar in colour but the median spots less well-defined; 5th tergite with only one poorly defined median spot. In addition to these markings, there are many blackish dots at the bases of all the setae. Abdomen with long setae at the sides of all tergites. Median setae on hind margin only absent on the 2nd tergite; 4th and 5th tergites with a complete row of setae. 2nd sternite with extensive setae. Genitalia small, black. Cerci in lateral view acute and slightly curved ventrad; surstyli (= coxite) long, rounded at apices; praeputium dark and strongly toothed, cylindrical; paraphallus of simple structure, the sagittal one divided; ventral lobes straight and toothed on their margins.

Length: 8·2 mm.; of wing, 7·1 mm.

Holotype ♂. EAST NEPAL: Taplejung Distr., edge of mixed forest above Sangu, *c.* 6,500 ft, 17.x–1.xi.1961. Brit. Mus. (Nat. Hist.).

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